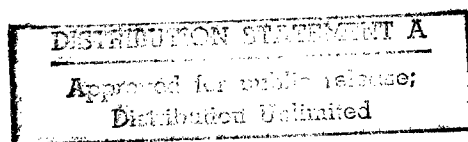


DEPARTMENT OF DEFENSE IN-HOUSE RDT&E ACTIVITIES



FY97

Management Analysis Report

Department of the Army

Department of the Navy

Department of the Air Force

DoD Agency (USUHS - AFRRI)

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DEPARTMENT OF DEFENSE IN-HOUSE RDT&E ACTIVITIES REPORT

for
Fiscal Year 1997

Prepared for:

The Office of the Secretary of Defense
Director, Defense
Research and Engineering
The Pentagon
Washington, DC 20301

FOREWORD

Introduction

The DoD In-House Research, Development, Test & Evaluation (RDT&E) Activities Report was started in the mid-1960s by the Office of Laboratory Management within the Office of the Secretary of Defense, at the request of the then Director of Defense Research and Engineering (DDR&E), Dr. John Foster. The annual report has been produced in official form since 1966.

The DoD In-House RDT&E Activities Report and database project is the DDR&E's central source of information on laboratory status, and serves four essential purposes: (1) since inception, it has been the only compilation of statistics organized by location on DoD RDT&E Activities; (2) it provides the basis for prompt responses to many general queries about DoD RDT&E Activities, without recourse to special surveys, etc.; (3) it provides a historical database which can be utilized for tracing consolidations and organizational changes, and for special analyses and trend studies; and (4) it provides insight into the technical and organizational environment of the DoD Laboratories and the financial manpower and facility investments made in them.

The Office of the Deputy Director of Defense Research and Engineering for Laboratory Management and Technology Transition leads a Steering Group which is responsible for the preparation and oversight of the report and its underlying database. The Steering Group is composed of representatives from the offices of the Director of Defense Research and Engineering, the Director, Test Systems Engineering & Evaluation, the Deputy Assistant Secretary of the Army for Research and Technology, the Chief of Naval Research, the Deputy Assistant Secretary of the Air Force (Science, Technology and Engineering), and the Director of the Armed Forces Radiobiology Research Institute of the Uniformed Services University of the Health Sciences (USUHS). This year the Steering Group and the Science and Technology Business Process Reengineering Office developed an improved data collection process taking advantage of both the existing infrastructure at the activities and utilizing the latest Internet technologies. This improvement initiative has resulted in a more accurate and timely report.

A DoD organizational entity is considered to be a "DoD RDT&E Activity" when it is owned and operated by the Government, and a minimum of 25% of its total effort is devoted to research, exploratory or advanced development, engineering development, demonstration/validation, systems or operational support, or some combination thereof. Examples are a research laboratory; a research, development and engineering center (RDEC), a test center or proving ground, and a multi-functional entity such as a "warfare center." An "In-House" RDT&E Activity is an organization where a minimum of 25% of the in-house manpower and/or 25% of the obligational authority used is devoted to research, exploratory or advanced development, engineering development, etc., conducted in-house.

Structure of Report

Selected data for the In-House RDT&E Activities of the Army, Navy, Air Force and the USUHS are summarized in tables in the first section of the report. Following the tables are individual sections which cover the In-House RDT&E Activities of the three Military Services and USUHS. Each Activity is described in a standard multi-page format.

Activities are listed alphabetically within their respective military departments. A partial organization chart, entitled "Abbreviated Functional Chart - Technical

Organizations", appears for each Activity to provide an overview of its technical operations. Funding data are broken down into the standard RDT&E sub-categories: 6.1 - Research, 6.2 - Exploratory Development, 6.3 - Advanced Development, 6.4 - Demonstration & Validation, 6.5 - Engineering and Manufacturing Development, 6.6 - Management Support, 6.7 - Operational Systems Development, and Non-DoD. All zero-filled report data fields reflect a zero amount reported.

Organizational changes for FY97 appear in Appendix A. Appendix B contains definitions of the data elements displayed in this report (any data element definition changes for FY97 are italicized). Appendix C defines selected abbreviations and acronyms.

Every effort has been made to provide accurate information. Each submission was reviewed and approved by the head of the reporting Activity. All numbers and statements submitted by each Activity were then thoroughly examined by the members and staff of the Steering Group. Please note, though, that this report does not represent the total DoD RDT&E program. It is also not an accounting or financial management document, but rather a "snapshot" of the operation of the individual Activities contained in the report. All funding data reflect total obligational authority received in FY97. The data in this report should not be summarized or used for detailed comparative analyses, because the Service labs/centers use a number of different business accounting systems to satisfy their special needs. See Appendix B for further explanations.

The report is used by numerous DoD organizations, as well as various committees of Congress, the Library of Congress and the General Accounting Office. The report provides easily accessible comprehensive and accurate information without frequent querying of field Activities.

Significant Changes for FY97

Funding

The funding tables now depict In-House Managing Out-of-House figures for each Activity. These are funds incurred in planning and administering out-of-house programs by personnel of the reporting organizations. In previous reports, the funding figures in this category were combined with Out-of-House total, which is the total amount for the fiscal year reporting period for direct mission oriented work performed, or to be performed, by other than government personnel at the reporting organization..

Personnel

Personnel figures for the FY97 report were obtained from end of FY personnel data, provided by the Services, to the Defense Manpower Data Center (DMDC). The goal of the In-House Report - DMDC data interchange, is to leverage DMDC data, which is the authoritative source of DoD personnel data, with In-House report data, to produce an indisputably accurate document. This interchange streamlines the reporting process through the utilization of existing data sources, which reduces data collection efforts at the Activity level. It also increases the consistency and comparability of DoD activity data.

DMDC data was reviewed by all activities and discrepancies were thoroughly researched and resolved. Additionally, activities were provided the opportunity to include footnotes in the final report regarding published personnel figures.

In-House Report Web Site

This report can be found in the **DOCUMENTS** section on the DDR&E/LM&TT Web Site at www.dtic.mil/labman, for on-line browsing. Web access to the FY97 Report has been expanded to allow it to be downloaded (by individual Activity, by Service, or in its entirety) not only as a Word document, but also in the Adobe Acrobat Portable Document Format (PDF).

Distribution

This publication should be given widespread distribution in the DoD Laboratories, both as an internal resources reference document at the Director and Commanding Officer level, and as a catalog of general activity at the bench level. It provides laboratory staff an opportunity to familiarize themselves with the functional capabilities of other DoD Laboratories, thereby encouraging scientists and engineers to communicate with their counterparts at other labs on problems of common interest.

In addition, this publication has proven helpful to those in the private sector interested in exploring the potential for technology cooperation/transfer with DoD Laboratories (for example, Cooperative Research and Development Agreements - CRADAs).



Lance A. Davis
Acting Director, Defense Research and Engineering

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TABLE 1. ARMY RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1997

INSTALLATION	FUNDING DATA (MILLION'S \$)				PERSONNEL DATA					
	TOTAL	TOTALS IN-HOUSE	TOTALS RDT&E	IN-HOUSE RDT&E	TOTAL MIL	TOTAL CIV	DOC MIL	DOC CIV	ENG MIL	ENG CIV
Aberdeen Test Center	105.212	70.847	57.977	40.567	99	893	0	5	0	260
Aeromedical Research Laboratory	7.447	7.400	4.749	4.702	49	42	6	6	0	7
Armament RDEC	722.221	262.566	292.612	132.908	46	3,341	0	68	14	1,706
Army Materiel Systems Analysis Activity	30.554	21.917	12.241	11.785	14	290	0	7	0	203
Army Research Institute	30.684	17.241	26.079	13.966	11	115	0	42	0	30
Army Research Laboratory	399.850	235.011	323.936	182.270	59	2,240	3	316	25	965
Aviation RDEC	172.019	67.464	129.887	39.027	14	458	0	23	0	182
Aviation Technical Test Center	11.975	11.975	9.838	9.838	35	102	0	0	26	37
CECOM RDEC	457.065	112.327	308.033	78.104	35	2,097	0	76	7	1,303
Cold Regions Research & Engineering Lab	34.608	27.709	17.050	13.432	0	241	0	33	0	58
Construction Engineering Research Labs	62.143	33.788	41.311	21.299	2	339	0	37	2	131
Dugway Proving Ground	47.186	29.140	40.885	27.811	16	454	0	20	0	73
Edgewood RDEC	440.993	137.832	174.158	66.226	50	1,063	2	26	11	426
Institute of Surgical Research	5.990	5.990	5.989	5.989	186	52	21	4	25	27
Medical Research Institute of Chemical Defense	30.248	19.200	27.740	16.692	53	150	20	29	12	32
Medical Research Institute of Environ. Medicine	11.503	8.975	9.698	7.824	66	84	20	24	1	31
Medical Research Institute of Infectious Diseases	27.048	26.888	23.686	23.526	232	195	38	42	10	48
Missile RDEC	503.752	124.741	326.509	51.495	7	1,748	0	37	7	1,189
Natick RDEC	112.004	41.684	94.223	28.565	33	409	0	10	9	129
OPTEC-Test and Experimentation Command	99.300	99.300	48.400	48.400	386	617	0	1	0	94
Redstone Technical Test Center	57.507	57.507	26.623	26.623	0	150	0	0	0	94
Tank-Automotive RDEC	199.479	84.656	108.591	29.057	12	1,156	0	24	4	681
Topographic Engineering Center	67.423	32.917	45.541	15.899	7	376	0	11	2	201
Walter Reed Army Institute of Research	62.105	62.105	54.603	54.603	344	403	52	76	100	87
Waterways Experiment Station	259.267	151.315	228.847	149.375	4	1,258	0	183	4	466
White Sands Missile Range	303.395	214.122	276.255	192.136	428	2,248	2	12	8	606
Yuma Proving Ground	118.897	28.110	96.703	15.234	110	725	0	0	0	123

TABLE 2. ARMY RDT&E ACTIVITIES, FACILITY DATA, FY 1997

INSTALLATION	LOCATION	SPACE AND PROPERTY						COST (MILLIONS \$)	
		ACRES	SPACE (THOUSANDS OF SQ FT)		OTHER		TOTAL	PROP	EQUIP
Aberdeen Test Center	Aberdeen Prov. Gnd, MD	56,707	119,250	138,713	981,076		1,239,039	580,700	0,216
Aeromedical Research Laboratory	Fort Rucker, AL	44	102,000	26,000	20,000		148,000	11,896	49,105
Armament RDEC	Picatinny Arsenal, NJ	6,493	308,822	1,118,865	2,579,161		4,006,848	182,706	184,911
Army Materiel Systems Analysis Activity	Aberdeen Prov. Gnd, MD	4	0,000	104,700	17,100		121,800	3,600	6,200
Army Research Institute	Alexandria, VA	0	17,500	61,400	8,600		87,500	13,900	11,800
Army Research Laboratory	Adelphi, MD	5,335	1,250,000	864,000	673,000		2,787,000	697,000	561,587
Aviation RDEC	St. Louis, MO	0	109,000	64,000	15,000		188,000	6,652	27,796
Aviation Technical Test Center	Fort Rucker, AL	11,005	0,000	77,633	125,004		202,637	2,800	117,978
CECOM RDEC	Ft. Monmouth, NJ	1,140	323,078	395,052	111,106		829,236	79,600	285,307
Cold Regions Research & Engineering Lab	Hanover, NH	207	242,200	2,400	66,400		311,000	3,200	0,000
Construction Engineering Research Labs	Champaign, IL	33	113,400	48,300	36,700		198,400	0,000	16,776
Dugway Proving Ground	Dugway, UT	798,855	64,000	182,000	2,254,000		2,500,000	183,000	102,000
Edgewood RDEC	Aberdeen Prov. Gnd, MD	0	760,000	431,000	635,000		1,826,000	94,000	142,061
Institute of Surgical Research	Fort Sam Houston, TX	1	73,850	11,000	50,300		135,150	13,000	15,600
Medical Research Institute of Chemical Defense	Aberdeen Prov. Gnd, MD	30	37,419	38,433	125,024		200,876	23,400	0,032
Medical Research Institute of Environ. Medicine	Natick, MA	1	93,676	10,869	9,423		113,968	25,505	31,687
Medical Research Institute of Infectious Diseases	Fort Detrick, MD	150	121,000	78,000	148,000		347,000	24,892	42,825
Missile RDEC	Redstone Arsenal, AL	4,000	974,866	237,330	143,587		1,355,783	227,797	346,248
Natick RDEC	Natick, MA	58	368,474	32,336	23,786		424,596	18,902	2,496
OPTEC-Test and Experimentation Command	Fort Hood, TX	22	19,900	41,000	0,000		60,900	6,300	3,000
Redstone Technical Test Center	Redstone Arsenal, AL	14,000	460,000	52,000	133,000		645,000	146,000	0,000
Tank-Automotive RDEC	Warren, MI	85	498,949	174,870	22,202		696,021	123,900	229,733
Topographic Engineering Center	Alexandria, VA	0	88,776	35,081	53,134		176,991	22,400	23,521
Walter Reed Army Institute of Research	Washington, DC	0	403,544	178,372	151,472		733,388	16,460	64,311
Waterways Experiment Station	Vicksburg, MS	2,812	2,555,940	234,240	48,330		2,838,510	493,295	565,042
White Sands Missile Range	White Sands Missile, NM	2,311,129	1,870,620	957,528	1,568,209		4,396,357	510,558	532,033
Yuma Proving Ground	Yuma, AZ	1,009,403	28,209	141,199	2,075,873		2,245,281	156,596	228,655

TABLE 3. NAVY RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1997

TABLE 3. NAVY RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1997												
INSTALLATION	FUNDING DATA (MILLIONS \$)				PERSONNEL DATA							
	TOTAL	TOTALS IN-HOUSE	TOTALS RDT&E	IN-HOUSE RDT&E	TOTAL MIL	TOTAL CIV	DOC MIL	DOC CIV	ENG MIL	ENG CIV		
Naval Aerospace Medical Research Lab	3,598	3,145	2,912	2,591	24	26	9	3	2	8		
Naval Air Warfare Center	4,064,824	1,473,260	1,264,038	685,949	2,653	14,057	4	238	215	5,240		
Navy Clothing & Textile Research Facility	4,116	2,862	1,691	1,330	1	44	0	1	0	30		
Naval Cmd., Control & Ocean Surv. Center	1,818,011	632,742	546,295	194,172	334	5,340	0	192	19	2,190		
Naval Dental Research Institute	1,505	1,488	1,392	1,375	25	11	0	3	0	3		
Naval Facilities Engineering Service Center	160,300	54,014	34,992	15,393	21	554	0	22	0	327		
Naval Health Research Center	14,133	5,588	11,150	4,127	21	58	8	14	3	19		
Naval Medical Research Institute	32,828	21,409	16,871	12,264	201	148	59	26	68	76		
Naval Medical Research Unit # 2	5,257	5,179	3,539	3,491	19	94	9	2	5	52		
Naval Medical Research Unit # 3	7,312	7,312	5,821	5,821	37	168	8	20	11	13		
Navy Personnel Research & Dev. Center	21,973	9,059	13,790	6,386	14	116	0	29	6	53		
Naval Research Laboratory	795,960	366,621	658,936	318,445	183	3,153	0	854	0	921		
Naval Submarine Medical Research Lab	4,742	4,742	3,656	3,656	24	28	8	7	0	9		
Naval Surface Warfare Center	2,964,814	1,643,102	954,914	520,402	489	15,828	0	390	0	6,843		
Naval Undersea Warfare Center	851,600	436,000	289,800	183,400	83	4,493	0	137	30	2,338		

TABLE 4. NAVY RDT&E ACTIVITIES, FACILITY DATA, FY 1997

INSTALLATION	LOCATION	SPACE AND PROPERTY					COST (MILLIONS \$)	
		ACRES	SPACE (THOUSANDS OF SQUARE FEET)			TOTAL	REAL PROP	EQUIP
Naval Aerospace Medical Research Lab	Pensacola, FL	3	102.900	6.700	10.200	119.800	13.000	6.200
Naval Air Warfare Center	Patuxent, MD	1,145,213	6,391.720	3,031.092	15,042.288	24,465.100	1,504.173	1,170.245
Navy Clothing & Textile Research Facility	Natick, MA	0	12.667	16.000	5.630	34.297	9.478	2.803
Naval Cmd., Control & Ocean Surv. Center	San Diego, CA	899	1,886.000	929.000	1,647.000	4,462.000	208.000	209.000
Naval Dental Research Institute	Great Lakes, IL	0	21.260	6.000	8.000	35.260	5.000	2.093
Naval Facilities Engineering Service Center	Port Hueneme, CA	10	68.000	84.000	35.000	187.000	30.000	8.700
Naval Health Research Center	San Diego, CA	0	32.330	12.250	2.200	46.780	0.000	1.934
Naval Medical Research Institute	Bethesda, MD	7	161.930	63.875	0.000	225.805	8.700	22.620
Naval Medical Research Unit # 2	Jakarta, Indonesia	0	15.132	11.797	22.330	49.259	2.086	2.175
Naval Medical Research Unit # 3	Cairo, Egypt	4	68.200	9.100	71.300	148.600	10.600	5.000
Navy Personnel Research & Dev. Center	San Diego, CA	3	42.200	16.400	4.500	63.100	1.147	5.133
Naval Research Laboratory	Washington, DC	532	3,188.283	227.533	399.043	3,814.859	195.334	462.602
Naval Submarine Medical Research Lab	Groton, CT	0	46.190	15.798	0.000	61.988	8.223	4.020
Naval Surface Warfare Center	Arlington, VA	71,767	5,523.000	1,897.000	12,802.000	20,222.000	1,156.000	802.800
Naval Undersea Warfare Center	Newport, RI	3,242	3,006.000	351.000	2,864.000	6,221.000	288.085	609.954

TABLE 5. AIR FORCE RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1997												
INSTALLATION	FUNDING DATA (MILLIONS \$)			PERSONNEL DATA								
	TOTAL	TOTALS IN-HOUSE	TOTALS RDT&E	IN-HOUSE RDT&E	TOTAL MIL	TOTAL CIV	DOC MIL	DOC CIV	ENG MIL	ENG CIV		
Armstrong Laboratory	208.363	66.651	191.312	64.080	692	772	91	140	179	218		
Arnold Engineering Development Center	296.850	259.705	277.515	249.146	108	193	0	4	40	59		
Development Test Center	572.900	288.660	497.130	249.870	4,202	2,604	0	7	419	584		
Flight Test Center	641.092	256.284	575.717	240.443	4,206	3,257	5	6	154	616		
Phillips Laboratory	629.378	61.287	463.632	47.690	498	1,146	47	214	179	331		
Rome Laboratory	470.137	76.472	368.938	58.722	117	906	9	79	54	405		
Wright Laboratory	1,069.600	127.200	1,031.900	127.000	316	2,054	47	201	182	1,124		

TABLE 6. AIR FORCE RDT&E ACTIVITIES, FACILITY DATA, FY 1997

TABLE 6. AIR FORCE RDT&E ACTIVITIES, FACILITY DATA, FY 1997									
INSTALLATION	LOCATION	SPACE AND PROPERTY						COST (MILLIONS \$)	
		SPACE (THOUSANDS OF SQUARE FEET)				TOTAL	EQUIP		
		ACRES	LAB	ADMIN	OTHER			REAL PROP	
Armstrong Laboratory	Brooks AFB, TX	96	1,034.000	157.000	1.000	1,192.000	64.860	74.116	
Arnold Engineering Development Center	Arnold AFB, TN	39,081	1,063.600	386.200	1,449.800	2,899.600	1,341.962	226.156	
Development Test Center	Eglin AFB, FL	463,533	2,321.171	897.209	9,428.241	12,646.621	933.398	714.549	
Flight Test Center	Edwards AFB, CA	297,375	283.000	276.000	9,031.000	9,590.000	807.896	337.000	
Phillips Laboratory	Kirtland AFB, NM	16,620	996.000	652.000	846.000	2,494.000	1,051.200	1,109.500	
Rome Laboratory	Rome, NY	1,543	721.000	236.000	438.000	1,395.000	52.287	113.700	
Wright Laboratory	WPAFB, OH	1,202	1,826.227	559.638	569.220	2,955.085	983.500	2,107.190	

TABLE 7. USUHS RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1997												
INSTALLATION	FUNDING DATA (MILLIONS \$)				PERSONNEL DATA							
	TOTAL	IN-HOUSE	TOTALS	IN-HOUSE	TOTAL	TOTAL	DOC	DOC	DOC	DOC	DOC	DOC
			RDT&E	RDT&E	MIL	CIV	MIL	CIV	MIL	CIV	MIL	CIV
Armed Forces Radiobiology Research Institute	12.631	12.456	11.168	10.993	62	100	10	41	22	26		

TABLE 8. USUHS RDT&E ACTIVITIES, FACILITY DATA, FY 1997									
INSTALLATION	LOCATION	SPACE AND PROPERTY					COST (MILLIONS \$)		
		ACRES		SPACE (THOUSANDS OF SQUARE FEET)			TOTAL		EQUIP
				LAB	ADMIN	OTHER	REAL PROP		
Armed Forces Radiobiology Research Institute	Bethesda, MD	10		61.750	34.257	23.908	119.915	15.000	12.400

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DEPARTMENT OF THE ARMY

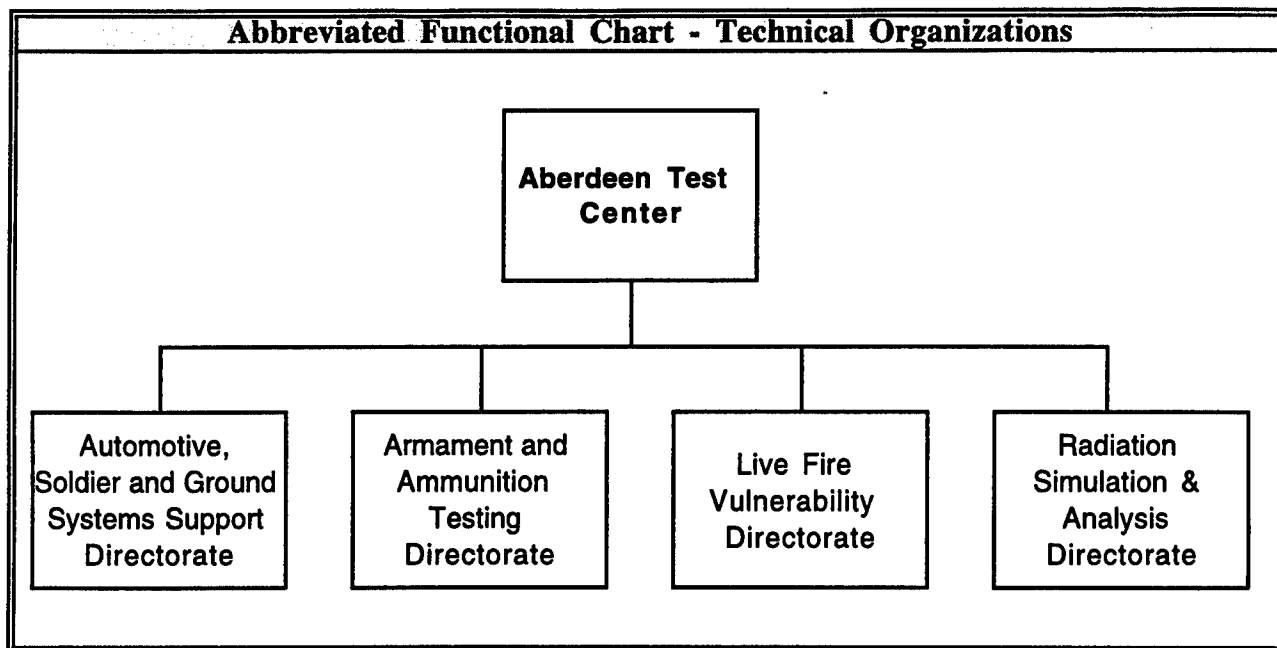


DEPARTMENT OF THE ARMY

The Army's twenty-seven (27) In-House RDT&E Activities are:

Aberdeen Test Center	2-2
Aeromedical Research Laboratory	2-8
Armament Research, Development and Engineering Center	2-12
Army Materiel Systems Analysis Activity	2-22
Army Research Institute.....	2-28
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Aberdeen Test Center



Aberdeen Test Center

Aberdeen Proving Grd, MD 21005-5059
(410) 278-3574

Commander: Colonel Richard O. Bailer
Technical Dir.: James W. Fasig

MISSION

Aberdeen Test Center is the most diverse test facility within DoD, testing a broad spectrum of military weapons systems and equipment including armored vehicles, guns, ammunition, trucks, bridges, generators, night vision devices, individual equipment (boots, uniforms, helmets, etc.), and surface and underwater marine systems. As a multi-purpose proving ground, with a temperate climate, our primary mission is to plan, conduct, analyze and report on projects supporting research, development, test and evaluation (RDTE), design, engineering, production, surveillance and operational tests for DoD and other government agencies, contractors, foreign government, and private industry. In this single location, ATC can subject an item to a full range of tests from automotive endurance and full weapons performance with environmental extremes, to full-scale live fire vulnerability/survivability/lethality testing utilizing an extensive array of test ranges/facilities, simulators and models. In addition to testing domestic systems, we exploit foreign systems to assess the enemy threat. We also develop state-of-the-art test procedures (DoD, International), methodologies and instrumentation in order to meet the test requirements of advancing military technologies. ATC is partnered with CINCLANTFLT forming the Chesapeake Regional Range Complex which provides air, land and sea test and training support to the joint warfighter.

CURRENT IMPORTANT PROGRAMS

Bradley Fighting Vehicle System
Wide Area Mine
M830A1 Cartridge, 120MM
M829A2 Cartridge, 120MM
M1A2 ABRAMS Tank
Heavy Assault Bridge
M88A2 Hercules Improved Recovery Vehicle

Technology Transfer Efforts

Federal Highways Administration/MD State Highway Administration/MD State Police/ATC- ATC has successfully developed and fielded an Aggressive Drive Imaging System prototype. The System integrates MD State Police LIDAR system with ATC developed advanced imaging technologies consisting of computer driven digital imaging video instrumentation and components.

HP White Laboratories/ATC- The parties continue to cooperatively perform efforts focused in the research and development of intermediate level fire test technologies, hardware testing and fire hazard compliance issues. Currently, the partners are working to determine the capability of class B hand held fire extinguishers and the effectiveness on fuel fire in accordance with UL 711 (Fire Extinguishers, Rating and Fire Testing).

Hartford Community College/ATC- Through a cooperative agreement, ATC and HCC shared audio visual technologies to produce a promotional video for the college. HCC students and ATC engineers worked to complete the effort using the unique capabilities in the ATC production studio. Students gained hands-on training with advanced audio visual tools and techniques.

AV Technologies/ATC- Under a cooperative agreement ATC and AV successfully completed the first phase supporting the test and training initiative for the PANDUR commercialization program. This is the first combined test and training initiative between the private sector and this DoD facility. The PANDUR program will continue through FY98.

Defensive Driving, Inc./ATC- Using ATC's unique testing facilities, the New Jersey based company performed defensive driving courses for corporate members. The availability of the hard surfaced course provided the customer with the necessary elements to successfully complete the course requirements.

University of California at Berkeley (UCB)/ATC- ATC provided four SOMTE soldiers to support UCB's technology demonstration project during the National Automated Highway System Demonstration in San Diego in August 1997. The ATC personnel operated developmental Buick LeSabre automobiles that featured automated steering, lane control, and vehicle "platooning". The Demonstration was the first public exposure to the technologies that will provide driverless transportation in the 21st century.

EQUIPMENT/FACILITIES

World-renowned automotive test/obstacle courses; numerous interior and exterior firing ranges; environmental simulation capabilities including rough-handling and vibration, electromagnetic interference and environmental conditioning capabilities; full transportability test capability to include rail, roadability, MIL-STD 209 pull and tie-down, internal and external air transport; Underwater Explosion test ponds and Depleted Uranium Containment Fixture (Superbox) for live fire vulnerability and lethality testing; sophisticated non-destructive test facilities; robotics test facilities; pulse radiation facility; Firing Impulse Simulator; state of the art industrial complex which includes maintenance and experimental fabrication capabilities; secure airfield.

Aberdeen Test Center
 Aberdeen Proving Grd, MD 21005-5059
 (410) 278-3574

Commander: Colonel Richard O. Bailer
 Technical Dir.: James W. Fasig

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.015	0.000	0.086	0.101
6.2	3.039	0.031	1.769	4.839
6.3	1.130	0.011	0.657	1.798
Subtotal (S&T)	4.184	0.042	2.512	6.738
6.4	0.000	0.000	0.000	0.000
6.5	1.362	0.014	0.792	2.168
6.6	33.540	0.120	13.068	46.728
6.7	0.000	0.000	0.000	0.000
Non-DOD	1.481	0.010	0.852	2.343
TOTAL RDT&E	40.567	0.186	17.224	57.977
Procurement	12.772	NA	7.442	20.214
Operations & Maintenance	3.183	NA	2.133	5.316
Other	14.325	NA	7.380	21.705
TOTAL FUNDING	70.847	0.186	34.179	105.212

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.031

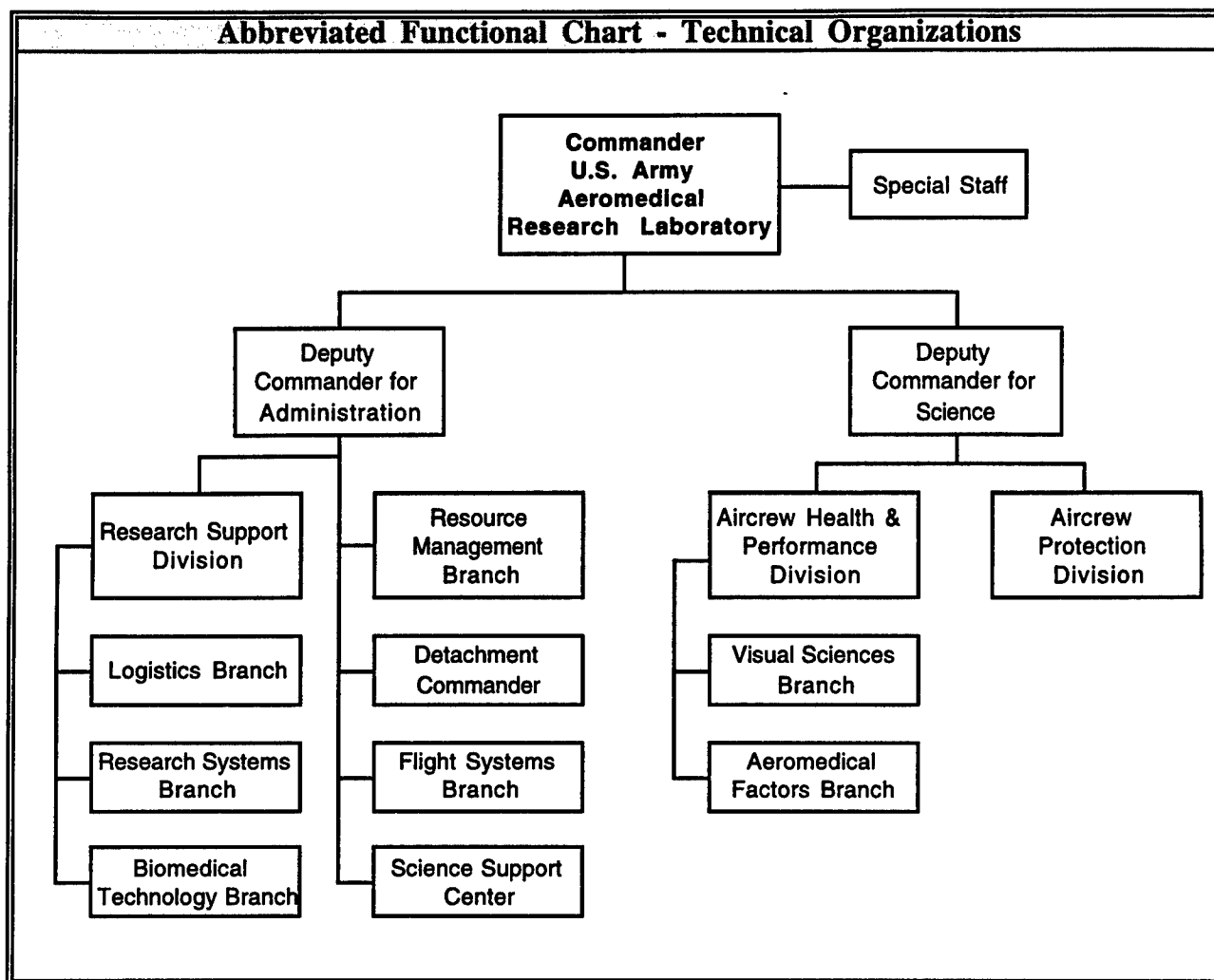
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	99	99
CIVILIAN	5	260	628	893
TOTAL	5	260	727	992

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	119.250	REAL PROPERTY	580.700
ADMIN	138.713	* NEW CAPITAL EQUIPMENT	0.023
OTHER	981.076	EQUIPMENT	0.216
TOTAL	1,239.039	* NEW SCIENTIFIC & ENG. EQUIP.	0.018
ACRES	56,707	* Subset of previous category.	

NA = Not Applicable

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Aeromedical Research Laboratory



Aeromedical Research Laboratory
Fort Rucker, AL 36362-0577
(334) 255-6917

Commander: COL Cherry L. Gaffney
Deputy Cdr/Sci: COL Clyde D. Byrne

MISSION

Conducts medical research related to the effects of military aviation, combat vehicles, and other weapons systems on soldier health and performance. Additionally, performs research on the impact of continuous operations on crew performance, on health hazards of emerging military materiel systems, develops training and operational strategies to cope with those detractors, and develops design criteria for aviator protective equipment and visual systems.

CURRENT IMPORTANT PROGRAMS

Investigation of Spatial Disorientation in the Rotary-Wing Environment and Counter Measures

Airworthiness Certification Evaluations of Medical Devices Intended for Use Aboard U.S. Army Rotary-Wing Aircraft During Medical Evacuations

Aviator Performance Effects of Sustained Operations, Sleep Cycle Disruption and Coping Mechanisms

Aviation Life Support Equipment Retrieval Program

Crew Coordination Analysis System Development (160th SOAR)

Aviator Helmet Protective Capability and Tolerance to Head Supported Mass (In Support of Land Warrior, Air Warrior, and Comanche Programs)

Visual Performance Comparison of Flat Panel and Analog Display Technologies

Soldier Tolerance to Biomechanical Impact and Prevention of Impact Injury

COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS (CRDA)

Advanced Active Noise Reduction, Active Noise Cancellation (ANR/ANC) for Aviation Headsets and Microphones

Research and Development on Advanced Aircrew Protection Systems (Simula)

Research and Development of Advanced Restraint Systems (H. Koch and Sons)

Research, Development, Test and Evaluation of Aeromedical Evacuation Equipment

Gulf Coast Alliance for Technology Transfer (GCATT)

Research Agreements with the University of Houston and the University of Alabama at Birmingham

EQUIPMENT/FACILITIES

Multi-Axis Ride Simulation System; Helmet Drop Test Tower and Impact Facility; Variable Center of Gravity Helmet Device; Head and Neck Inertial Loading Sled; Mass Properties (Center of Mass Location & Mass Moments of Inertia) Measurement System; Biochemistry Lab; UH-60 Visual Flight Simulator for Aeromedical Research; Helicopter Inflight Monitoring System; Modified Aircraft for Inflight Medical Research (JUH-1 Huey; JUH-60 Blackhawk; C-12D); Data Acquisition and Telemetry Systems for use in either JUH-1 or JUH-60; Sleep Study Center; Spatial Disorientation Laboratory; Crew Coordination Analysis Center; High Intensity Impulse Noise Generator (Shock Tube); Mobile Acoustics Lab; Anechoic and Reverberation Chambers; Scanning Laser Ophthalmoscope; Ophthalmic Telemedicine System; Corneal Physiology and Topography Center; Optical Testing Lab; Optical Fabrication Facility; Electro-Optical Testing Lab; Visual Displays Analysis Center; Scientific and Medical Research Information Center; MEDEVAC Equipment Testing Facility.

Aeromedical Research Laboratory
Fort Rucker, AL 36362-0577
(334) 255-6917

Commander: COL Cherry L. Gaffney
Deputy Cdr/Sci: COL Clyde D. Byrne

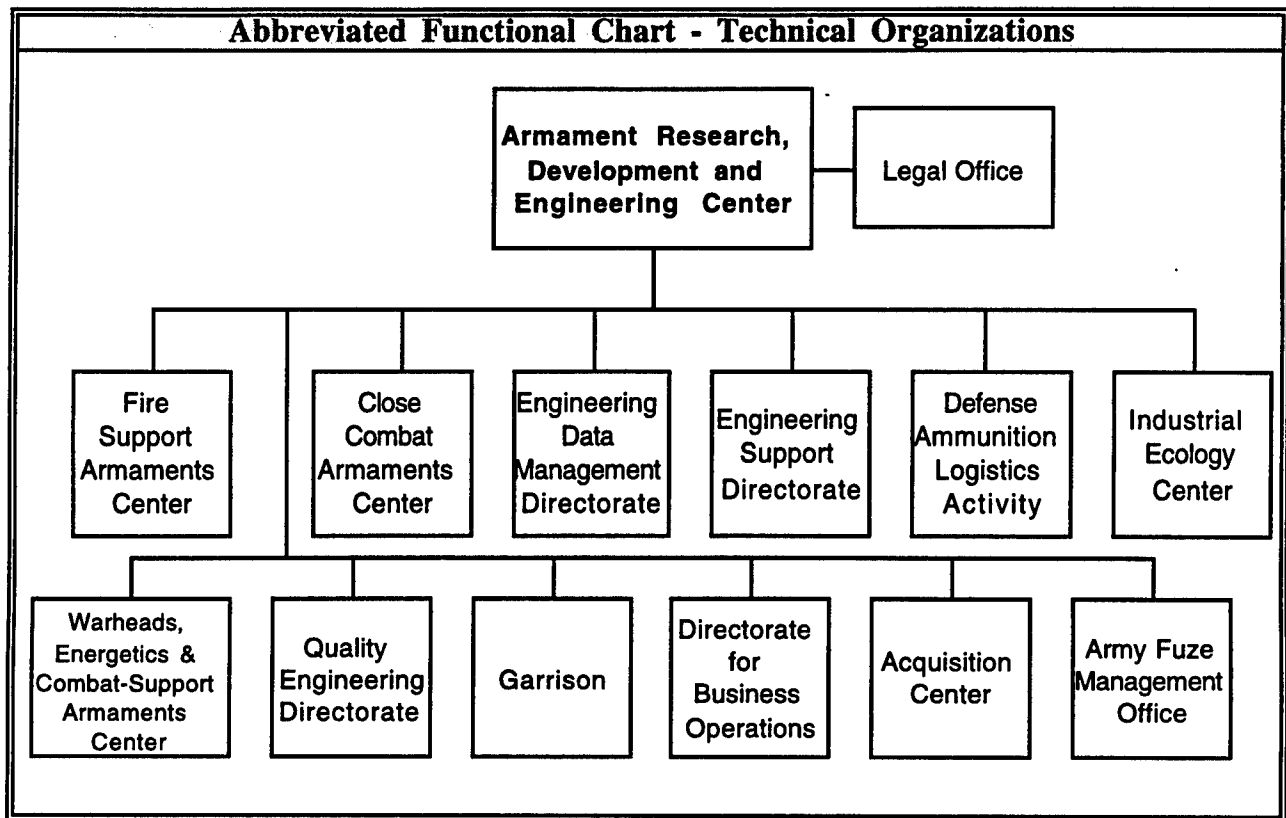
FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.036	NA	NA	0.036
6.1 Other	0.312	0.000	0.000	0.312
6.2	4.169	0.047	0.000	4.216
6.3	0.028	0.000	0.000	0.028
Subtotal (S&T)	4.545	0.047	0.000	4.592
6.4	0.025	0.000	0.000	0.025
6.5	0.089	0.000	0.000	0.089
6.6	0.043	0.000	0.000	0.043
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	4.702	0.047	0.000	4.749
Procurement	0.044	NA	0.000	0.044
Operations & Maintenance	0.106	NA	0.000	0.106
Other	2.548	NA	0.000	2.548
TOTAL FUNDING	7.400	0.047	0.000	7.447

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	6	0	43	49
CIVILIAN	6	7	29	42
TOTAL	12	7	72	91

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	102.000	REAL PROPERTY	11.896
ADMIN	26.000	* NEW CAPITAL EQUIPMENT	0.559
OTHER	20.000	EQUIPMENT	49.105
TOTAL	148.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.478
ACRES	44	* Subset of previous category.	

NA = Not Applicable

Armament Research, Development and Engineering Center

Armament Research, Development and Engineering Center

Picatinny Arsenal, NJ 07806-5000
(973) 724-6000

Commander: BG James W. Arbuckle
Technical Dir: Mr. Carmine Spinelli

MISSION

TACOM-ARDEC is a business center of the Tank-Automotive and Armaments Command (TACOM), a major subordinate command of the US Army Materiel Command (AMC). TACOM-ARDEC provides the United States military with the firepower to achieve decisive battlefield victory. Our mission is to conduct or manage research, development and life cycle engineering, including quality engineering for ammunition, weapons, fire control and associated items. This includes engineering support for production and integrated logistics support. We provide procurement and management of initial production quantities and technical support to soldiers and equipment in the field throughout their entire life cycle. TACOM-ARDEC is also the Army executive agent for research and development for pollution prevention.

The primary function of TACOM-ARDEC will continue to be the smart buyer for armaments. TACOM-ARDEC currently retains the technical knowledge and expertise for current, historical and future experimental and developmental ammunition and weapon systems, many of which have no counterpart in industry. This knowledge base allows TACOM-ARDEC to insure that the government does not waste time and money on efforts that have historically proven not to work. In order to develop and maintain this knowledge base, TACOM-ARDEC is active in all phases of the life cycle process. We maintain a technology base to assure that technologies transition to weapon systems developments which currently account for over 90% of the Army's lethality. TACOM-ARDEC performs unbiased system analyses that consider a diverse number of systems and technologies, both in-house and contractor developed, resulting in the best technical approach and best buy decisions. TACOM-ARDEC also performs unbiased technical assessments of the current state-of-the-art in ammunition and weapon systems that points the way to future developmental programs and technology transfer to industry.

CURRENT IMPORTANT PROGRAMS

Our core business areas and corresponding technical initiatives are:

SMART MUNITIONS: To develop self-contained munitions for all mission areas with the ability to autonomously sense, engage, and kill their intended targets.

INDIRECT FIRE: To maximize defeat of enemy personnel and vehicular targets by developing advanced artillery and mortars with extended range and accuracy. We will achieve autonomous operations, increase range, increase rate of fire, and reduce manpower requirements over current fielded systems.

DIRECT FIRE: To develop weapons and munitions which will defeat the most advanced enemy armor through increased frontal penetration, higher hit probabilities, and enhanced top attack capabilities, while reducing crew size and stress.

SOLDIER WEAPONS: To upgrade armaments for light infantry and special operation forces (SOF), and to develop advanced small caliber weapons that will significantly increase kill capability, enhance survivability and improve the capability to destroy hard targets, and to develop non-lethal weapons for low intensity/peacekeeping missions.

CURRENT IMPORTANT PROGRAMS (continued)

MINES & DEMOLITIONS: To defeat advanced helicopters, vehicles & personnel with highly intelligent minefields, with features such as wide area destruction, complete user control, and Identification Friend or Foe (IFF) capability.

FUZING & LETHAL MECHANISMS: To greatly increase the lethality of armament materiel by focusing on advanced chemical energy warheads (shaped charge and explosively formed penetrators), kinetic energy (KE) penetrators, associated warhead materials, and low collateral damage munitions. Also, to create fuzes with integrated sensors, signal processing, and guidance and control; capable of performing target/clutter discrimination and having multi-option capability for compatibility with autoloaders, and containing electronic safe and arm (S&A) functions.

FIRE CONTROL: To provide life cycle engineering and management of fire control subsystems, software, command, control, and communications; test, measurement and diagnostic equipment and training devices utilizing an integration of sensors, computers, advanced controls and artificial intelligence aids for a rapid response to command orders of engagement.

MUNITIONS SURVIVABILITY: Insure the survivability of the critical warfighting assets through Munitions Logistics, Munitions Survivability, and the Hazards of Electromagnetic Radiation to Ordnance (HERO) Certification. The program provides "built in" survivability improvements that will help preclude destructive reactions within logistics nodes, transportation assets and combat vehicles using proven/available technologies. The HERO effort assesses the susceptibility of high priority munitions to electromagnetic hazards.

TACOM-ARDEC is the Army agent for pollution prevention R&D, providing the Army with technical management for pollution prevention R&D, integration of pollution prevention concerns into the weapons system R&D process, and technical assistance and integration expertise to the Army, other government agencies, and industry.

Additionally, some of our key strategic system initiatives are:

- **Light Weight 155 mm Howitzer.** The Light Weight 155mm Howitzer will be a lighter towed howitzer with digital fire control and advanced navigation systems. It will replace our current light division general support artillery system - the M198. The system provides improvements in lethality, survivability and responsiveness.
- **Low Cost Competent Munitions (LCCM).** LCCM is an artillery fuze concept which will provide a low cost guidance capability for the existing stockpile of 155 mm projectiles as well as for future projectiles. LCCM greatly improves the accuracy of cannon artillery at extended ranges. LCCM will enhance the lethality and responsiveness of indirect fires, and ease the ammunition logistics burden.
- **Intelligent Mine Field (IMF).** IMF is a system of Wide Area Munitions, acoustic sensors, and command and control devices that can autonomously implement obstacle intent to hunt and kill moving armored vehicles. It enhances survivability and lethality, and will reduce the logistical burden associated with transporting large numbers of conventional mines.
- **Extended Range Artillery Projectile (XM982).** The XM982 is a 155 mm, DPICM extended range artillery projectile. It will allow current cannon systems to deliver improved submunitions out to a range of 37 km. It is an innovative design that combines base bleed and rocket assist technologies. It enhances the lethality and survivability of the force.

CURRENT IMPORTANT PROGRAMS (continued)

- **Advanced Sensor Submunition Technology (ASST).** ASST will be a rocket or missile delivered submunition that will detect, classify, maneuver and attack moving armor targets. It combines three types of sensors: infra red, millimeter wave and laser radar. It will match the best kill mechanism to the target type by using a selectable explosively formed penetrator warhead. ASST will have an "identification friend or foe" capability.
- **Objective Individual Combat Weapon (OICW).** OICW will be a lightweight weapon capable of firing kinetic energy projectiles and an air-bursting fragmentation munition. It will allow soldiers to effectively attack targets at greater ranges, and to attack targets in defilade. It combines leading edge technologies in miniaturized fuzing; integrated fire control; lightweight, high strength materials; and munitions effects. OICW will increase the lethality and survivability of the individual soldier. It is the sole lethality component of the Dismounted Battle Lab's 21st Century Land Warrior (21 CLW) Top Level Demonstration.
- **Less than Lethal Defeat Mechanisms.** TACOM-ARDEC has taken a leading role in the development of Nonlethal Technologies. With increasing emphasis on peacekeeping, low-intensity conflict and humanitarian missions, it becomes important to devise weapons which restrain or immobilize. To this end, TACOM-ARDEC is developing weapons such as: sponge grenades (co-developed with ARL), which are designed to incapacitate without imparting serious injury; acoustic weapons, which project sound waves, causing nausea and disorientation; sting nets, which envelop a foe and deliver a nonlethal electrical shock to discourage struggle; laser and other directed energy munitions, which are designed to degrade vehicle sensors; and radio frequency and electromagnetic pulse weapons, which could be utilized against enemy equipment in order to disrupt their electronics. Many of these technologies serve as dual-use applications for use in riot-control and civil disturbance situations.
- **The Autonomous Intelligent Submunition (AIS)** represents a major leap forward in sensors for force-multiplying systems. AIS increases smart submunition effectiveness against a wide variety of targets using breakthroughs in sensors and onboard computer software. Weapon system enhancements include intelligent target prioritization, selectable warheads and increased sensor footprint capabilities. The system concept that would use AIS combines high resolution infrared and millimeter-wave sensors with high-speed computing power and a steerable parafoil to find, prioritize and destroy armored vehicles, missile launch sites and a multitude of other militarily significant targets. The AIS lethal mechanism would be a multi-mode EFP which attacks the chosen target (with a target-specific effect) from above as the submunition loiters and descends over the general target area, while its advanced sensors and steerable parafoil permit the system to intelligently search a wide area for the most desirable target.
- **Cased Telescoped Ammunition and Gun Technology (CTAGT)** is an innovative means of improving the packaging and design of conventional medium caliber ammunition. This concept combines improved propellants with dimensionally compressed ammunition to improve volumetric efficiency. Cased telescoped ammunition, when compared with conventional cartridge ammunition, is 30% smaller in volume, offers higher performance and is easier to handle. The introduction of CTAGT into gun systems allows for smaller, more reliable handling mechanisms with fewer parts.
- **TACOM-ARDEC has over 47 active CRADAs. Some of these are:**
 - **Picatinny Innovation Center (PIC)** - County College Morris
 - **Air rifle terminal ballistics** - Forensic Pathology Associates
 - **Material compatibility analyses with liquid propellant** - General Dynamics
 - **Proximity fuze sensors for munitions** - KDI Precision Products

CURRENT IMPORTANT PROGRAMS (continued)

- Epileptic sensor - New York State Center for the Disabled
- Recuperator designs and virtual reality modeling - NIKE
- Magnetron sputtering techniques - NJIT
- Advanced materials for imaging applications - Rennsselear Polytechnic Inst
- Environmentally friendly technologies for lead-based paint removal - Rutgers University
- Cubane derivatives - University of Rochester
- Improved shaped charge - Western Atlas, International
- Pharmaceutical applications of cubane derivatives - Yeshiva University

EQUIPMENT/FACILITIES

TACOM-ARDEC's **Stereolithography Lab** provides rapid prototyping for form, fit and function trials and produces masters for soft modeling and investment castings. The lab's capabilities range from the design and fabrication of a sheet "brass catcher" for the Squad Automatic Weapon to the modeling of complete scaled versions of the Crusader and Paladin recoil system prototypes. This service, available to TACOM-ARDEC engineers, academia and industry, reduces the developmental time and associated manufacturing and procurement costs by up to 75%.

The Automated Inspection Device for Explosive Charge in Shell (AIDECS) replaces visual x-ray film inspection of loaded artillery projectiles. The AIDECS pilot system at TACOM-ARDEC is the only operational unit of its kind, providing the capability to automatically examine 155mm rounds and smaller shells. Base separations, cracks, cavities and other critical defects in the explosive filler are detected by scanning the shell with x-rays. Radiation scattered from within the shell is electrically detected, and a computer analysis identifies and classifies each defect in the explosive. The computer makes an accept/reject decision for each shell and prints an inspection report. Benefits of the AIDECS system include improved reliability for detecting base separations and other critical defects accomplished in a totally automated manner, and cost savings due to elimination of x-ray film.

TACOM-ARDEC's **Distributed Interactive Simulation (DIS)** facility supports a full spectrum of battlefield simulation activities to determine how technology, weapons and weapon mixes can be used to maximize the effectiveness of the soldier. DIS analyses of weapons in combined arms scenarios can influence designs long before any metal has been "bent", thereby minimizing cost and development time. Linkage to other sites allows real-time interaction on a virtual battlefield.

The Department of Defense's Center for X-Ray Diffraction at TACOM-ARDEC is well recognized for its complete line of sophisticated X-Ray equipment, including two of the latest diffractometers and spectrometers, as well as for the comprehensive knowledge and experience of its personnel. The facility is used to enhance ballistic performance by determining the optimal crystal orientation of warhead and penetrator materials.

Benet Labs represents the Army's capability for large caliber cannon research, design and development, prototype production and engineering support. Benet works closely with the Watervliet Arsenal's cannon production facility to provide rapid prototyping services in support of new and improved weapon systems. Some of Benet's facilities are:

EQUIPMENT/FACILITIES (continued)

- **FATIGUE EXPERIMENTATION FACILITY:** capability of duplicating firing pressures in its breech mechanism facility and tube facility. This allows the rapid evaluation of new concepts of materials, and the establishment of safe firing lives for these components in the laboratory rather than the much more expensive experimental firing previously necessary. These combined facilities provide Benet with a capability not available anywhere.
- **GAS DYNAMICS LABORATORY:** The Gas Dynamics Laboratory is a new research multi-task facility which includes two firing bays, a high bay area and a laboratory. The high bay area is used for experiments for heavy weapons and weapon components. Instrumentation includes 12 channels of digital data capture and display in 3 synchronized nicolet oscilloscopes with 4K points per channel. There is also a data acquisition system with 10 channels at 256K points per channel.
- **INTEGRATED CAE/CAD/CAM FACILITY:** Benet Labs has a Computer Aided Design system, integrated with Watervliet Arsenal's Computer Aided Manufacturing system. This allows the ready interactive transmission of technical data electronically. Thus, the stress analysts' calculations can be integrated into the engineers' designs for final implementation on the manufacturing floor.
- **TURRET LABORATORY:** Benet Labs provides engineering support for Turret hardware (less fire control systems) for Tracked Combat Vehicles, including the M551 Light Weight Air Transportable Assault Vehicle, and M60A3 and M1A1 Main Battle Tanks. The Turret Laboratory currently houses all of these vehicles and the tools and equipment necessary for investigation of problems relating to field, depot and spare parts procurement activities.
- **TERRAIN SUSPENSION/TURRET ENVIRONMENT SIMULATOR:** This motion system consists of a large platform (18 ft x 10 ft) mounted on six large hydraulic cylinders, a hydraulic power supply unit and an electronic control cabinet. The simulator is a six-degree-of freedom system (vertical, transverse, longitudinal, put, roll and yaw) and can provide all six motions simultaneously. The maximum payload that can be carried by the simulator is 18,000 lbs. This, it is capable of evaluating a full size tank turret.
- **FULL SCALE INVESTMENT CASTING FOUNDRY:** Benet's investment casting foundry provides the necessary base from which technical support is provided to the Laboratory in the form of the development of new castings and providing prototype castings, to Watervliet Arsenal in the form of production castings to meet initial deliveries until a contractor can start full deliveries, and to Outside Contractors in the form of technical assistance to overcome problems encountered in meeting the requirements of castings for production.
- **MOLTEN SALT DEPOSITION FACILITY:** The refractory metals electrodeposition pilot plant has a its purpose the coating of large caliber gun tube liners and metals having a higher erosion and corrosion resistance than chromium. It has the ability to electrodeposit metals such a tantalum, niobium, molybdenum and tungsten.
- **VESSEL ELECTROPLATING FACILITY:** A full-scale pilot production facility, built and operated by Benet Laboratories in a joint venture with the Watervliet Arsenal, provides a new process technology and the capability for plating an improved form of chromium (LC chrome) on any size cannon tube up to and including the 30-foot long 155-mm "Extended Range Cannon" considered for the Howitzer Improvement Program.
- **5KW SURFACE TREATING LASER:** The 5KW, CO2 Laser Metalworking Center integrates a Spectra-Physics 975 industrial Laser system, with a CNC programmable 4-axis work positioner (including rotary tilt table). The Laser system currently provides improved process control via CNC programmability and system flexibility, plus the inherent capability of a Laser to focus large amounts of usable energy in a small area.

EQUIPMENT/FACILITIES (continued)

The Armament Technology Facility (ATF) is a 52,000 square foot, secure and environmentally safe integrated small and cannon-caliber design and test facility. The ATF co-locates simulation modeling, design, validation, and diagnostic engineering with the capability to immediately conduct confirmation experimental firings of interior and exterior ballistics. This concurrent engineering facility will support multi-service infantry, air defense, aircraft and combat vehicle armament systems and is available to government as well as private industry. It has four weapon validation bays with an environmental chamber capable of weather conditions between -65F to +165F; two indoor ranges - the first 100 meters in length and the second 300 meters. The latter can accept a Bradley Fighting Vehicle System firing its primary armament; or an Abrams-series tank firing secondary armament. The 300-meter range also has a -65F to +165F environmental chamber.

The Keith L. Ware Simulation Center is a research facility specializing in the analysis of helicopter armaments and small arms. The Ware Center is composed of two 100 meter indoor firing ranges and two 1000 inch indoor firing ranges. Small arms can be fired from any number of ground and vehicle mounts as well as several weapon mount simulators located at the center. Helicopter armaments are fired from the 6-Degree-of-Freedom simulator which is capable of mounting a helicopter fuselage and inputting vibration and other motions into it. This allows armaments to be investigated in realistic conditions at a great cost savings over field trials. A large environmental room is available connected to one of the 1000 inch firing ranges. This room can subject items to extreme temperatures from -65 degrees F to +160 degrees F as well as other environmental conditions such as humidity, salt fog, salt immersion, sand and dust. The Ware Simulation Center has extensive instrumentation capabilities to measure characteristic data and performance of weapon systems such as: accuracy, dispersion, rate of fire, round velocity, blast pressure, recoil force, temperature, strain, acceleration, linear and angular displacement, voltage and current. High speed video and regular speed video are also available.

Electric Armaments Research Center (EARC) has one of the largest capacitor-based pulse power supplies in the world. The EARC was used to conduct large caliber component experiments of electric gun systems, most notably a composite 90mm railgun. This gun tube was one of several different approaches being investigated for a future tank main gun. This tube and others of its class are capable of accelerating special anti-armor rounds to extremely high energies and velocities.

The Instrumentation and Measurements Lab includes cutting-edge capabilities in the art of data reduction, signal processing, shock resistant telemetry design and radar analysis. One of its facilities consists of a radio frequency anechoic chamber equipped with a radar cross-section (RCS) measurement system utilizing a supercomputer. RCS measurements of various systems, including projectiles, identify radar reflectivity patterns. This technology is used for artillery experiments to evaluate and improve projectile performance parameters such as range, yawing motion, spin and position. Some services and capabilities include: Development of telemetry concepts and systems Telemetry component technology; In-bore and in-flight telemetry techniques Secure telemetry systems; Qualification, compatibility and RFI Coordination of telemetry operations with test ranges; Collection and reduction of telemetered firing test data; Printed Circuit Board design, fabrication and assembly; Measurement System Design and Implementation Acoustic and Magnetic Signature Analysis Image Analysis/Processing; Industrial Control, Design and Implementation RF Anechoic Studies.

The Advanced Warhead Testing Facility provides a safe, armor plate, that will be attached to a 35 foot long tunnel. This allows for extended target standoff experiments for explosively formed penetrators, shaped charges and other experimental warheads.

EQUIPMENT/FACILITIES (continued)

Our subsonic, transonic and supersonic wind tunnels provide excellent opportunities to apply research to time and cost savings. The facility is used to design, develop and conduct experiments on tactical and training rounds for the Army. The facility has been awarded twelve U.S. patents in the last five years. One of the patents was for a stabilizer for the M831A1 TP-T tank training ammunition, developed using wind tunnel data. Optimization resulting from the experiments saved an estimated \$40 million in annual production costs.

Electromagnetic Environmental Effects (E3) facilities perform assessments on weapon systems to determine their compliance against numerous electromagnetic environments such as Personnel Electrostatic Discharge (PESD), Helicopter Electrostatic Discharge (HESD), Hazards of Electromagnetic Radiation to Ordnance (HERO), Electromagnetic Vulnerability (EMV), and Electromagnetic Interference (EMI). High explosives are also assessed at our facilities.

ENVIRONMENTAL EXPERIMENTATION FACILITIES

- Air Guns for linear acceleration experiments: to 200,000 g with soft recovery.
- Rotary acceleration centrifuges: to 1300 g. have slip rings permitting measurement of arming time of fuzes and safing and arming devices.
- Altitude and climatic walk-in and bench chambers for the simulation of any world-wide temperature and humidity conditions.
- Drop facilities up to 110 ft.
- Jolt, Jumble, Leak, Load, Loose Cargo, Pressure, Rough Handling, Salt, and Fog experiments all with on-line data acquisition and analysis - Mechanical Shock experiments up to 30,000 g. - Water Immersion, Solar Radiation, Spin, Stacking, Thermal Shock, Vacuum-Steam-Pressure, and Vibration: Random, sine, and gunfire, simulating transportation and tactical vibration at extreme temperatures.

Ranges for large caliber ballistic weapons firings for Ammunition/component experiments: - Assembly, disassembly, and modification of ammunition - Foreign ammunition exploitation - Fragmentation studies of ammunition - Hazard classification experiments - Malfunction investigation - Propellant/weapons evaluation - Surveillance of fielded ammunition - 155MM Ballistic Rail Gun-Soft Recovery of Projectiles/Components.

ADDITIONAL PROTOTYPE EXPERIMENTATION CAPABILITIES

- **The ARL/FSAC Blossom Point Field Facility.** The facility has a horizontal range of 6000 ft. (expandable to 12,000 ft.), a width of from 500 - 1000 ft., and a maximum ceiling of 10,000 ft. for high quadrant elevation (Q.E.) firings. Open field areas make fly-over, parachute and helicopter drops possible. Also, facilities are available for suspension of hardware. An on-site explosive loading room is available for the assembly of fuzes, ammunition, and explosive components. Temperature chambers provide for conditioning rounds or hardware to specified temperatures. The explosive range limit for any single surface detonation is 15 pounds net explosive weight.

- Instrumentation vans are available to acquire data using telemetry for ballistic firings and direct or remote coupling for static experiments. Photographic data can be acquired by either high resolution video or high speed photographer.

NON DESTRUCTIVE EVALUATION FACILITIES - 25 Million Electron Volt Betatron - 1 Million Electron Volt X-Ray Machine - 200, 250, 300 Thousand Electron Volt X-Ray Machines - 150 Thousand Electron Volt Faxitron Fluoroscope - Neutron Radiography with Californium Source - Automatic Scanning Densitometer - X-omat Automatic Film Processor - Conventional Ultrasonics - Eddy Current Inspection - Magnetic Particle Inspection - Computer Aided Ultrasonic Inspection - Holographic Interferometry - Impactoscope - Magnetic Flux Leakage Inspection

Armament Research, Development and Engineering Center

Picatinny Arsenal, NJ 07806-5000
(973) 724-6000

Commander: BG James W. Arbuckle
Technical Dir: Mr. Carmine Spinelli

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	2.261	NA	NA	2.261
6.1 Other	0.569	0.259	2.617	3.445
6.2	17.155	4.064	41.050	62.269
6.3	6.816	2.712	27.399	36.927
Subtotal (S&T)	26.801	7.035	71.066	104.902
6.4	45.656	1.234	12.465	59.355
6.5	18.984	0.993	10.035	30.012
6.6	38.554	3.298	33.316	75.168
6.7	2.436	1.812	18.305	22.553
Non-DOD	0.477	0.021	0.124	0.622
TOTAL RDT&E	132.908	14.393	145.311	292.612
Procurement	61.306	NA	271.048	332.354
Operations & Maintenance	57.702	NA	14.912	72.614
Other	10.650	NA	13.991	24.641
TOTAL FUNDING	262.566	14.393	445.262	722.221

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	17.450

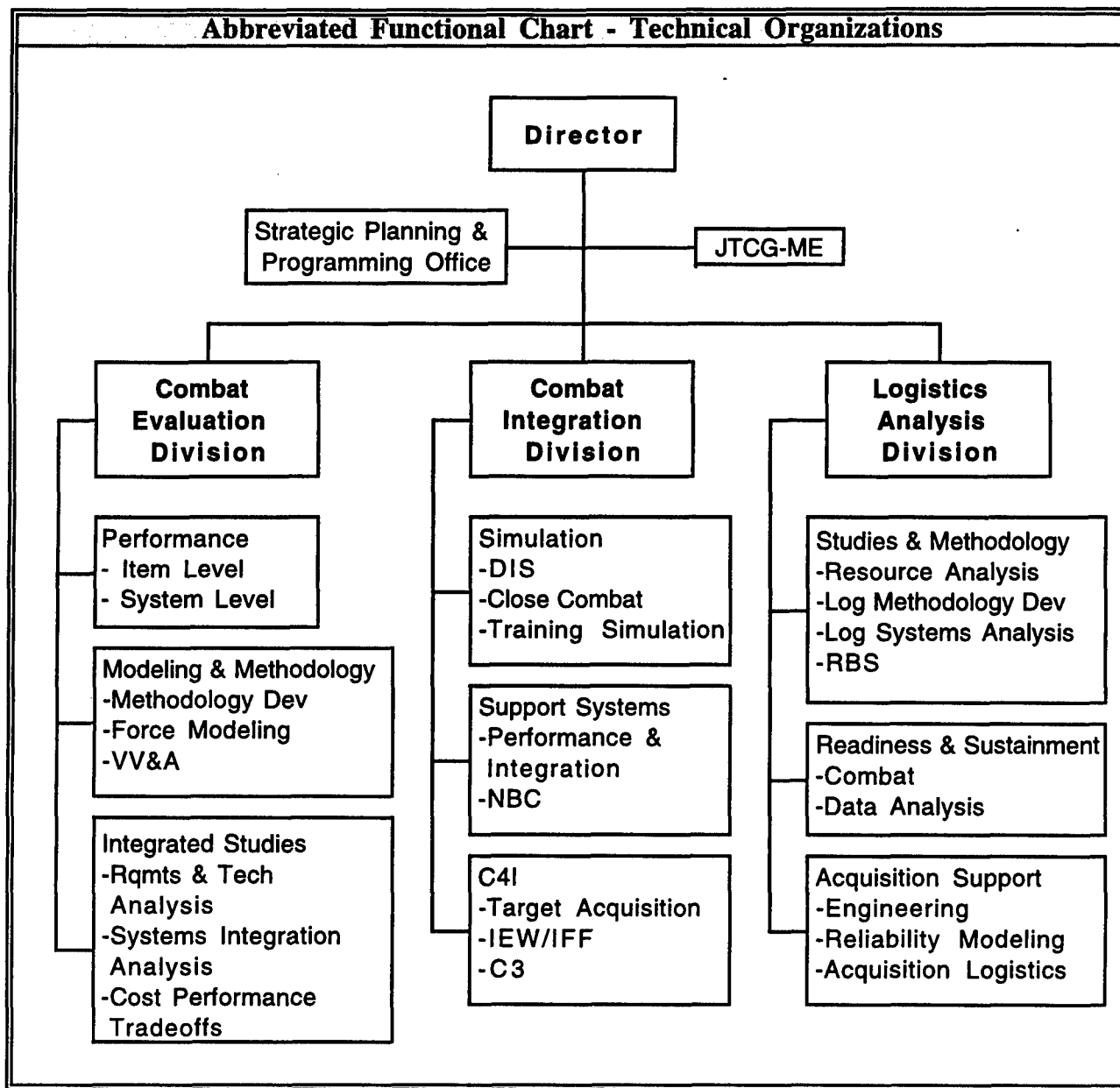
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	14	32	46
CIVILIAN	68	1,706	1,635	3,341
TOTAL	68	1,720	1,667	3,387

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	308.822	REAL PROPERTY	182.706
ADMIN	1,118.865	* NEW CAPITAL EQUIPMENT	0.000
OTHER	2,579.161	EQUIPMENT	184.911
TOTAL	4,006.848	* NEW SCIENTIFIC & ENG. EQUIP.	0.841
ACRES	6,493	* Subset of previous category.	

NA = Not Applicable

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Army Materiel Systems Analysis Activity



Army Materiel Systems Analysis Activity
Aberdeen Proving Gnd, MD 21005-5071
(410) 278-6614

Director: Mr. John J. McCarthy
Military Deputy: COL Charles J. McKenzie III

MISSION

Provide materiel and logistics systems analysis for the Army to support the decision making process.

CURRENT IMPORTANT PROGRAMS

The U.S. Army Materiel Systems Analysis Activity (AMSAA) has two primary mission areas: Materiel Systems Analysis and Logistics Systems Analysis. The materiel systems analyses are funded through AMSAA's RDT&E program; whereas, the logistics systems analyses are funded through AMSAA's OMA program. Materiel systems analysis is accomplished within three core mission functions: item and system level performance, modeling and simulation (M&S), and investment strategies. Wholesale and retail logistics analysis, logistics modeling and methodology development, and force projection and sustainment analysis comprise the core functions of Logistics Systems Analysis.

AMSAA is the Army's center for item and system level performance analysis and certified data. AMSAA utilizes automated databases and models to characterize the functionality of Army materiel systems. Unique models and methodologies have been developed to accurately predict critical performance variables, such as, weapon accuracy, target acquisition, rate of fire, the probability of inflicting catastrophic damage, and system reliability. This year standard performance data was provided to major Army and DoD studies, such as, analysis of alternatives (e.g. ATACMS/BAT P3I and Combat ID), Future Scout and Calvary System (FSCS) Cooperative Program Exploratory Analysis (CPEA), and Joint A2R2. As the Executive Agent for OSD for the tri-service Joint Technical Coordinating Group/Munitions Effectiveness program, AMSAA applies its item level performance expertise to manage the program and to ensure standardized weapons effectiveness assessments are used across the services. The publication of Joint Munitions Effectiveness Manuals (JMEM) provides single source documents for modelers, materiel developers, and strategic and operational planners. Examples of FY97 products include: JMEM Air-to-Surface Weaponing System (JAWS), Joint Anti-Air Model (JAAM), and Weapons Characteristics JMEM.

Systems performance analysis is initiated in the technology base and evolves with the system through requirements definition, the analysis of alternatives process, insertion into the acquisition cycle, and then extends to fielding and sustainment. AMSAA's linkage with the Integrated Concept Team (ICT) process creates an opportunity for the Army to take advantage of systems analysis early in the acquisition process. AMSAA is positioned to support ICTs through early requirements trade-off analysis before specific solutions are identified. As technologies are inserted into the Advanced Technology Demonstration (ATD) and Advanced Concept Technology Demonstration (ACTD) processes, AMSAA has the capability to perform verification, validation, and certification of performance data, provide an analytical basis for the formulation of exit criteria, conduct system performance analysis, and verify, validate and accredit required models and simulations. These capabilities support the timely transition of warfighting technologies from the technology base to integration into specific weapon system programs. AMSAA provides Army project managers and decision makers with comprehensive systems performance and effectiveness capability analysis for systems in the development process. Examples of systems analyses executed in FY97 are: FSCS CPEA, Crusader, AAV, PATRIOT, Follow-on to TOW (FOTT), the Extended Range MLRS, and Tank Extended Range Munition (TERM), and the Future Combat System (FCS). The integration of cost as an independent variable (CAIV) will help ensure the development of cost-effective systems that will provide critical war fighting capabilities to the Army After Next.

CURRENT IMPORTANT PROGRAMS (continued)

AMSAA's modeling and methodology capabilities support the development, linkage and accreditation of live, virtual, and constructive simulations, and provide unique tools that support systems analysis of both individual systems and combined arms environments. AMSAA has resident and maintains many models and simulations, most of which were developed in-house to address specific analytical voids. These models range from component level, physics-based models to force-on-force simulations. Also, AMSAA assists model developers with the development and execution of verification and validation plans to ensure new models and simulations faithfully represent actual systems. AMSAA has gained extensive experience in the planning, execution and analysis of Distributed Interactive Simulation exercises and in the verification and validation of Computer Generated Forces and System Simulators. In the Computer Generated Forces area, AMSAA led the Assessment Study that provided the basis for the Army's investment strategy and the decision to integrate the Modular Semi-Automated Forces and Close Combat Tactical Trainer. AMSAA is also actively engaged in developing new methodologies and models, such as Physics of Failure (PoF), to improve the reliability of systems. Target acquisition is another area that AMSAA is assisting in the development of new and improved methodologies.

Shrinking modernization budgets have forced the Army to increasingly focus its research and development efforts toward fewer critical systems and capabilities that will equip the force with the most "bang for the buck". AMSAA has developed and implemented new methodologies capable of examining decision alternatives in terms of value added, cost benefit, and total risk. The FSCS CPEA, recently completed for DA decision makers, is an example of how systems level performance and cost tradeoffs can be executed across various alternatives. The analysis focused on subsystem performance of sensors, signature management, C4I, mobility, integrated survivability, and firepower of the proposed weapon system alternatives. Similar analyses have and will be conducted on other acquisition programs, such as, FOTT and Combat ID.

AMSAA's logistics analysis expertise covers the full range of Army logistics needs, from the development and refinement of logistics models to the analysis of innovative or modified logistics concepts. AMSAA's studies have led to recommendations for major changes to the Army logistics system that will result in significant improvements in the supply, maintenance, and transportation processes.

AMSAA has developed a methodology, known as Readiness Based Sparing, that optimizes Class IX replenishment stocks while maintaining system readiness at a minimized cost at the division level. The methodology has been successfully demonstrated at several sites since 1990 and AMSAA is currently expanding the use of RBS in the National Guard. In addition, AMSAA is utilizing its logistics knowledge and capability in the development of a Predictive Logistics Supply concept to improve the supply process. The goals of the program are to provide increased flexibility and responsiveness to the customer, reduce the generation of excess, and to provide the best mix of supplies in a timely manner. The project will result in the development of a comprehensive Program Management Plan detailing a total system architecture. AMSAA logistics analyses support the Army acquisition process with level of repair analyses and initial provisioning analyses for materiel development programs ensuring initial stocks and maintenance concepts provide adequate logistics support and best value to the Army when systems are fielded.

AMSAA is heavily engaged in analysis to support the Army planning process for sustaining our forces during operations other than war, contingency operations, and in war. AMSAA has been tasked by the Army to study the entire War Reserves Automated Process in order to identify shortfalls in the current war reserves computation methodology and streamline the process. The results are expected to provide a considerable cost avoidance while improving the readiness of the Army's warfighting systems. AMSAA developed a methodology that it uses to determine contingency support packages for planned and potential operational deployments. Packages are developed for Class IX spare parts requirements at the Area Support Group, Core Support Group, and Direct Support Group and/or Organizational levels in support of wartime contingency planning.

CURRENT IMPORTANT PROGRAMS (continued)

These support packages have been instrumental in planning logistics support and have served to assist in Bosnia, Somalia, Rwanda and numerous other recent Army operations. Efforts are currently underway to expand the methodology to include all classes of supply.

AMSAA executes the Field Exercise Data Collection (FEDC) program which provides quantitative and qualitative operational maintenance, manpower, reliability and logistical support data for fielded materiel systems. The FEDC program supports combat sustainment and war reserve requirements in support of contingency forces worldwide (e.g. Operation Desert Storm, Operation Vigilant Warrior, Haiti, etc.). Field data also serves to validate critical data elements required in scientific, engineering, and logistical support studies.

AMSAA provides the Army with the critical information and analysis needed to facilitate the complex decisions required to move the Army into the next century. As resources become increasingly constrained, it is critical the Army leadership continue to have access to timely, reliable, and high quality analysis on which they can base the decisions required to shape the future Army. AMSAA has developed an integrated set of skills and tools focused on its core competencies to be responsive to the breadth and depth of systems analysis requirements for the Army now and into the next century.

EQUIPMENT/FACILITIES

Simulation facility for processing classified material. Simulation facility used for development and verification, validation, and accreditation of models and simulations. Additional equipment for use in support of our primary mission areas of materiel and logistics systems analysis.

Army Materiel Systems Analysis Activity
Aberdeen Proving Gnd, MD 21005-5071
(410) 278-6614

Director: Mr. John J. McCarthy
Military Deputy: COL Charles J. McKenzie III

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	11.785	0.000	0.456	12.241
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	11.785	0.000	0.456	12.241
Procurement	0.461	NA	0.000	0.461
Operations & Maintenance	4.846	NA	0.575	5.421
Other	4.825	NA	7.606	12.431
TOTAL FUNDING	21.917	0.000	8.637	30.554

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

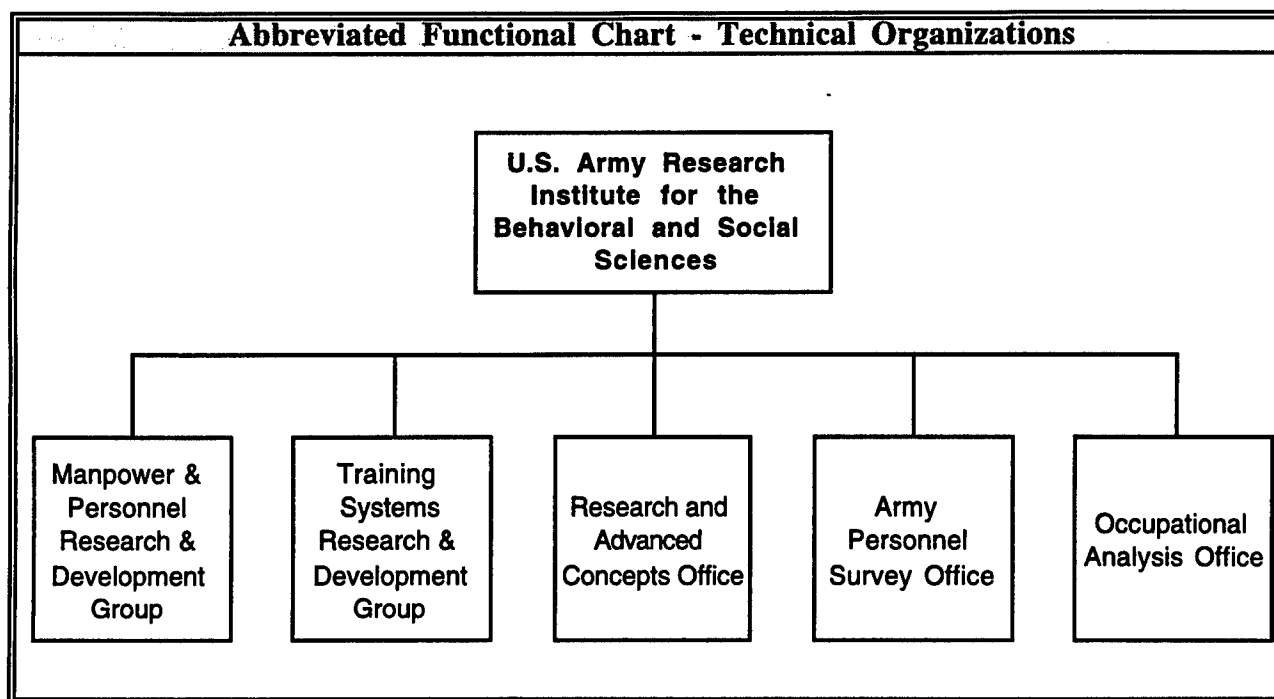
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	14	14
CIVILIAN	7	203	80	290
TOTAL	7	203	94	304

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	0.000	REAL PROPERTY	3.600
ADMIN	104.700	* NEW CAPITAL EQUIPMENT	0.035
OTHER	17.100	EQUIPMENT	6.200
TOTAL	121.800	* NEW SCIENTIFIC & ENG. EQUIP.	0.300
ACRES	4	* Subset of previous category.	

NA = Not Applicable

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Army Research Institute



Army Research Institute
Alexandria, VA 22333-5600
(703) 617-8636

Director: Dr. Edgar M. Johnson
Technical Director: Dr. Zita M. Simutis

MISSION

Maximize individual and unit performance and readiness to meet the full range of world-wide Army missions through advances in the behavioral and social sciences. ARI achieves its mission through activities of its research units located at its headquarters in Alexandria, VA and elsewhere CONUS and OCONUS (see the following list). In all cases ARI is a tenant at these locations where the host activity provides services (e.g., facilities, utilities) for a fee. Research units: Simulator Systems Research Unit (Orlando, FL); Armored Forces Research Unit (Ft. Knox, KY); Infantry Forces Research Unit (Ft. Benning, GA); Reserve Component Training Research Unit (Boise, ID); Rotary-Wing Aviation Research Unit (Ft. Rucker, AL); Ft Leavenworth Research Unit (Ft. Leavenworth, KS). Scientific Coordination Offices: Ft. Bragg (Ft. Bragg, NC); Ft. Hood (Ft. Hood, TX); USAREUR SCO (Heidelberg, GE); and TRADOC SCO (Ft. Monroe, VA).

CURRENT IMPORTANT PROGRAMS

1. Improve battle commander's thinking, reasoning and problem-solving skills for transition to the new digitized C4I systems.
1. Identify the skills and attributes that quality soldiers need to perform effectively on the 21st Century battlefield.
1. Determine the best "mix" of live, virtual and constructive simulations to maximize learning and minimize training costs.
1. Develop prototype computer-based training programs to improve individual combat skills.
1. Develop methods to improve RC training and to meet evolving missions.

EQUIPMENT/FACILITIES

In-house experimental facilities include laboratory and computer facilities for real-time, man-in-the-loop experimentation. Unique assets include: combat arms simulators; Virtual Reality test bed; a modular, reconfigurable flight simulator for helicopter pilot research; simulators for UH-1Fs, AH-74A and UH-60A helicopters; research access to SIMNET; and Battle Command Experimentation Center.

Army Research Institute
Alexandria, VA 22333-5600
(703) 617-8636

Director: Dr. Edgar M. Johnson
Technical Director: Dr. Zita M. Simutis

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.168	NA	NA	0.168
6.1 Other	0.034	0.657	1.852	2.543
6.2	6.088	0.676	3.579	10.343
6.3	4.543	0.495	1.103	6.141
Subtotal (S&T)	10.833	1.828	6.534	19.195
6.4	0.111	0.000	0.000	0.111
6.5	0.000	0.000	0.000	0.000
6.6	3.022	0.468	3.283	6.773
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	13.966	2.296	9.817	26.079
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	2.392	NA	1.330	3.722
Other	0.883	NA	0.000	0.883
TOTAL FUNDING	17.241	2.296	11.147	30.684

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

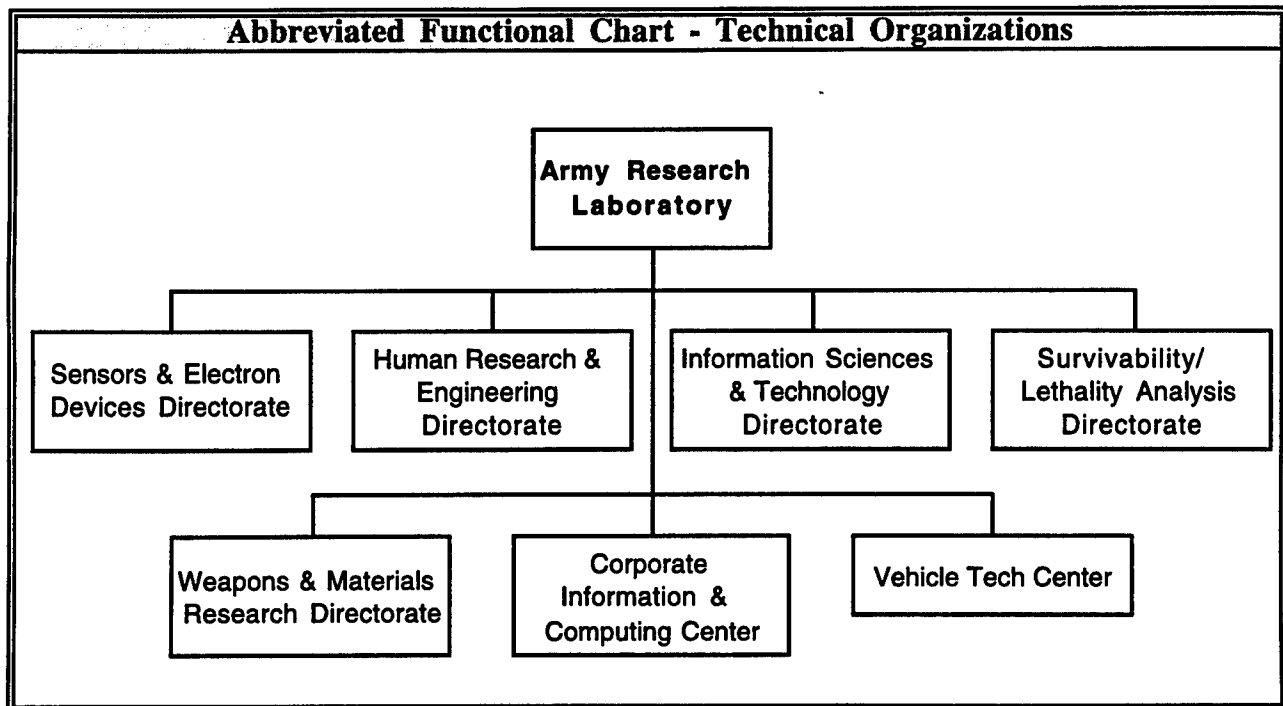
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	11	11
CIVILIAN	42	30	43	115
TOTAL	42	30	54	126

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	17.500	REAL PROPERTY	13.900
ADMIN	61.400	* NEW CAPITAL EQUIPMENT	0.000
OTHER	8.600	EQUIPMENT	11.800
TOTAL	87.500	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	0	* Subset of previous category.	

NA = Not Applicable

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Army Research Laboratory



Army Research Laboratory
Adelphi, MD 20783-1197
(301) 394-1067

Director: Dr. John W. Lyons
Assoc. Director PPB: Mr. Bruce M. Fonoroff

MISSION

The mission of ARL is to execute fundamental and applied research to provide the Army with the key technologies and analytical support necessary to assure supremacy in future land warfare.

ARL's vision:

- A laboratory preeminent in key research areas of science, engineering and analysis relevant to land warfare.
- A staff widely recognized as outstanding.
- A laboratory seen by Army users as essential to their missions.
- An intellectual crossroads for the technical community.

CURRENT IMPORTANT PROGRAMS

ARL's Grand Challenges:

Provide weapons systems technology for the future combat system (FCS)

Major Thrusts:

- Advanced armament propulsion and flight- Conventional, ETC, EM
- Advanced terminal effects
- Novel weapons concepts
- Material technology

Provide lighter, faster, more fuel-efficient mobile platforms to enhance deployability and reduce the logistics tail

Major Thrusts:

- Develop propulsion science and technology for future turbine engines
- Cooperate with DOE/Industry on efficient diesel engine technology
- Develop structural concepts and novel materials for light weight air and ground vehicles
- Improve loads and durability prediction technology

Provide commanders unprecedented real-time awareness of the battlefield

Major Thrusts:

- Electro-optic and photonics devices
- RF and electronic components
- Signal and imaging processing techniques

Significantly improve the battlefield soldier's ability to absorb information and make decisions

Major Thrusts:

- Digital battlespace architecture and operational capability
- Extend soldier's sensory perception
- Assimilation of battlefield information
- Data analysis and intelligent systems
- Simulation of C4I battlefield architectures
- Distribution of battlefield information
- Open simulation architecture
- Integrate soldier into Army systems and materiel

CURRENT IMPORTANT PROGRAMS (continued)**Solve the defensive information warfare problem****Major Thrusts:**

- Survivability, lethality, and environmental analysis in support of Army milestone reviews

- Develop tools, techniques and models for vulnerability and lethality analysis
- Electromagnetic Environmental Effects (E3) technology
- Information warfare analysis

Technology Transfer

- o New CRDAs = 35, New PLAs = 5
- o SBIR awards of \$14.7 million (Consisting of 43 phase I and 39 phase II (including 13 new-starts) and 7 STTR)
- o New International agreements = 18

ARL Personnel Exchanges

- o Guest researchers sent out to other labs: 110
- o Guest researchers brought into ARL: 203
- o Minimum stay is two weeks
- o Guest researchers sent to foreign countries: 6

Reshape

- o Downsized the Technology Transfer Office from 15 people to 10
- o Decreased the Technology Transfer Office budget by 54%

EQUIPMENT/FACILITIES**Flame Research Facility**

This facility enables us to conduct sophisticated studies in flame chemistry in support of propellant combustion simulation, so that advances can be made in gun propulsion. A wide variety of state-of-the-art spectroscopic and mass spectrometric diagnostic tools are used for experimental flame measurements. These measurements can be coupled with sophisticated flame computer models to support not only gun propulsion research but other flame research of military interest, such as fire suppression/extinction, hazardous waste incineration, and soot abatement.

Aerodynamics Range

This range is used to measure the actual flight motion of projectiles up to 37-mm caliber under realistic pressures, densities, and velocities. It is the only range in the U.S. capable of obtaining the accurate data on small and medium-caliber projectiles needed for the preparation of precise aiming data and firing tables.

Transonic Range

This facility measures the actual flight motion of large-caliber projectiles (up to 8-in. diameter) under realistic pressures, densities, and velocities. It is the only range in the free world capable of obtaining accurate data on large caliber projectiles needed for input to artillery fire-control computers and firing tables.

Tungsten Alloy Range

This range routinely conducts full-scale terminal-ballistic experiments with both kinetic-energy penetrators and shaped-charge warheads. It is able to fully instrument the terminal-ballistic tests of all advanced armors, including reactive armor.

EQUIPMENT/FACILITIES (continued)**Large-Caliber Experimental Test Facility**

This self-contained diagnostic test range conducts full interior ballistic testing and evaluation, from the ignition and combustion of propelling charges, through projectile in-bore travel, to muzzle exit. The facility tests and evaluates advanced conventional gun propulsion technologies, electrical propulsion concepts, and innovative propulsion schemes, such as in-bore ram acceleration.

Cannon-Caliber Electromagnetic Launcher Range

This installation measures the launch and flight performance of electromagnetic cannons up to 30-mm caliber. Equipped with a nearly 2.0-MJ power supply and a range of 250m, it performs diagnostics on electrical, mechanical, and aerodynamic qualities of electromagnetic gun systems.

Explosive Mechanics Facility

At this facility, two enclosed blast chambers can test up to 23-kg of explosive material. The chambers feature high-speed photography (2 million frames per second), flash x-ray devices, four-channel x-ray cineradiography, and high-speed recording equipment. Projectiles are fired into the chambers from an adjacent gun room. The chambers are currently being used to study thresholds in special explosives for reactive armor and fundamental initiation processes in solid explosives. Blast Range Here, three air-driven shock tubes, 0.6, 1.7, and 2.4-m in diameter, simulate air blast from nuclear and conventional weapons. The largest air-driven shock tubes in the U.S., they allow flat-topped and exponentially decaying blast waves to be produced. All three Services use the range for R&D blast loading and response investigations of full-size and scale-model materiel. (Note: A recently constructed Large Blast/Thermal Simulator, to be operated by the U.S. Army Test and Evaluation Command, features a nitrogen-driven shock tube with a 167-m² test section. The facility is currently in its characterization phase.)

Aircraft Vulnerability/Lethality Experimentation Facility (AVLEF)

This test range gives ARL a modern, centralized complex to evaluate the effects of explosive blast and fragmentation warheads, armor-piercing incendiary and high-explosive incendiary projectile impacts, and experimental penetrators and weapons, as well as unconventional threats, on aircraft components, subsystems, and complete operating fixed and rotary-wing aircraft. This testing capability benefits our participation in the DoD Joint Live-Fire Army-Air Force Program, as well as future developmental, specification, and live-fire test and evaluation associated with major Army aviation and anti-aircraft systems. In addition to Army test requirements, AVLEF supports Air Force and Navy-sponsored anti-aircraft warhead lethality evaluations and Aircraft Battle Damage Repair techniques. Specialized test resources and facilities at AVLEF include a blast pad for the evaluation of the effects of large blast/fragment warheads (of up to 100-lb of high explosives) on operating helicopters or fixed-wing aircraft, a covered full-scale dynamic turbine engine and helicopter drive train test pad, indoor and outdoor small-to-medium-caliber ballistic ranges for component and subsystem testing, EPA-approved fuel systems test capability, helicopter rotor-blade static loading fixture, remotely operated helicopter ground test tie-down, mobile airflow generator capable of 500 knots of airflow directed at targets, and a centralized test preparation and control/instrumentation building. A dedicated full-scale dynamic structural test building with ballistic capability was also constructed within AVLEF.

Obscurant Munitions Threat Simulation Facility

Employees at this facility design, develop, and produce munitions that emulate all known obscurant threats, so that we can accurately assess the survivability of developmental electro-optical and electromagnetic systems (e.g., Longbow, Hellfire Missile, and Javelin) on the "dirty" battlefield and advise how to make these systems more robust in these environments. We conduct experiments using simulators, fabricated in this facility, that produce threat smoke and obscurants designed to defeat systems operating in the visible, infrared, and millimeter-wave regions. The facility features a unique white-phosphorus filling machine as well as an analytical laboratory, munitions fabrication equipment, and associated processes.

EQUIPMENT/FACILITIES (continued)**Screening Threat Simulation Facility**

Accurate and realistic simulations of all threat smokes and a variety of experimental obscurants are produced here. Our people design and fabricate a variety of state-of-the-art large-area smoke-screen-generating equipment including foreign and experimental smoke generators, explosively disseminated pyrotechnic munitions and simulators, and indirect-fire simulators. The equipment may be mounted on various vehicles to provide for all-terrain capabilities. Field experiments conducted using this equipment support the analysis of survivability of developmental electro-optical systems and the subsequent design and selection of systems that will function in realistic battlefield environments.

Out-of-Laboratory Facility (OLF)

The OLF supports survivability analyses of developmental weapon systems and assists materiel developers in hardening systems to withstand the effects of electromagnetic pulse (EMP) and other electromagnetic environments. The facility obtains electromagnetic coupling and response measurements through two experimental techniques, radiated continuous-wave and current injection. The Continuous-Wave Instrumentation System (CWIS) radiates sinusoidal electromagnetic fields at selected frequencies between 10-kHz and 1-GHz using two antenna systems, a 1000-ft horizontal dipole and a log-periodic antenna with a large clear 2500-m² test volume. The OLF also features current injection devices capable of producing a broad range of double-exponential and dampened sinusoidal waveforms, including sources that meet MIL-STD-188-125 requirements. Data measured by both techniques are transmitted, via fiber-optic link and network analyzers, to the facility's instrumentation trailer. These, computational resources determine the time-domain response to transient electromagnetic radiation, including the EMP threat, and duplicate threat-level system response to EMP or other transient electromagnetic coupling.

Computerized Mobility/Portability Course

This calibrated obstacle course has become an Army standard for measuring the effects of soldier load on mobility and physiological functions. It consists of hard surfaces and wooded areas, along with obstacles that require the encumbered soldier to run, jump, crawl, climb, and maneuver on foot. The facility is computerized, with the capability for real-time data collection and management. A special feature is the biophysical telemetry system, which monitors the soldier's heart rate, skin and core temperatures, sweat rate, and "G" loading.

Computerized 600-m Small Arms Range

The Small Arms Range is a state-of-the-art facility for examining soldier weapon performance. It consists of multiple stationary and moving targets, controlled from a computer-equipped command and control center. The range permits the engagement of targets at a wide variety of distances, target exposure times, and angles. It features four firing lanes with target exposures from 10 to 550-m; these firing lanes can be operated simultaneously with different target scenarios. Each lane has five targets at 10 and 25-m for firing personal defense weapons and three targets each at 50, 75, 100, 150, 200, 250, 300, 400, 500, and 550-m for rifle firing. In addition to the fixed targets, each lane has three moving targets at 80, 130, and 180-m, which travel a distance of 15-ft at 90° to the shooter. Special in-house-designed targets and pneumatically operated target mechanisms are also featured. The computerized command and control center can present programmed arrays of targets at any distance, time interval, and sequence. The computer system has a software package that records and reduces range events, such as targets presented, target time, target hits, shots fired, and time of shot. The computer system also features an acoustic measurement system that provides horizontal and vertical coordinates of a hit or a near miss on a target.

EQUIPMENT/FACILITIES (continued)**Indoor/Outdoor Robotics and Automation Research and Test Facility**

Application of robotics technology and automated systems to military operations can enhance weapon system effectiveness, create new capabilities, and reduce risks to soldiers. This facility allows the development of robotics and related technologies. It includes an outdoor 14-acre test area that features a 25-mph sustained-speed test track, a standardized obstacle course, and an explosive-ordnance-disposal robot court, along with perimeter safety barricades and a Global Positioning System (GPS) position-location system. The indoor section contains a 35,000-ft² test area with an RF position-location system, central data-acquisition equipment, and a computing facility.

High-Performance Computing Resources

As part of the DoD High-Performance Computing Modernization Program (HPCMP), ARL has become a DoD Major Shared Resource Center (MSRC). State-of-the-art scalable parallel architectures, workstation clusters, and large vector configurations, supporting both classified and unclassified missions throughout the DoD science and technology community, will be operated at the ARL Aberdeen MSRC facility. ARL provides DoD leadership in the development, acquisition, and implementation of the latest networking technologies through the HPCMP Defense Research and Engineering Network (DREN) initiative. In addition to the MSRC, the Army High-Performance Computing Research Center (AHPCRC), located at the University of Minnesota, provides resources and assistance toward these efforts.

Composites Processing Research Facilities

Advanced low-cost, reliable processing techniques are essential to the future application of structural polymer matrix composites to Army ground vehicles, aircraft, and other materiel. ARL's state-of-the-art composites processing research facilities, such as the fully automated high-temperature (800° F) and pressure (450-psi) autoclaves, provide the necessary research tools to address scientific and engineering problems in process optimization and automated process control.

Materials Characterization Facility

This unique facility enables ARL's scientists and engineers to conduct highly detailed measurements of the properties of ceramics, polymers, glasses, and composites. It includes extensive state-of-the-art instrumentation for analyzing the chemical properties of materials at a wide range of temperatures, as well as a full complement of optical and electron microscopy and other electron probe instruments for microstructural analysis, x-ray residual stress analysis, and electrical, magnetic, and thermal property characterization. It also features a unique combination of surface analysis equipment.

Ion Implantation Facility

At this facility, employees develop and demonstrate novel ion surface treatments and coating techniques for Army materiel, such as machine tools and parts subject to corrosive or high-wear environments. This technology is demonstrating significant improvements in the quality of protective coating techniques, such as cadmium and chromium plating. In addition, the ion-implantation process has proven to be environmentally acceptable as an alternative to cadmium, chromium, and other heavy-metal plating processes which, collectively, account for 90 percent of the hazardous wastes generated by all electroplating processes within DoD. A cooperative effort with the Corpus Christi Army Depot is demonstrating the effectiveness and cost benefits of ion-implanted machine tools such as taps, drills, and end-mills.

EQUIPMENT/FACILITIES (continued)**Special Meteorological Equipment**

We have developed a variety of special meteorological equipment to meet unique Army and other customer requirements that cannot be satisfied with standard laboratory instrumentation. Some examples include specialized visible and infrared transmissometers used to evaluate Army electro-optical weapon systems operating in degraded and battlefield-obscured atmospheres, and an atmospheric profiler facility used to measure vertical profiles of wind speed, wind direction, and small-scale turbulence at altitudes up to 2-km in support of ballistic correction requirements. Most of this instrumentation falls within a 40-by-140-mile division-sized area of operations at White Sands Missile Range. We have a variety of automated and manned data-collection points throughout this area, including 20 automated surface observation stations, a meteorological rocket launch complex, and two 500-ft instrumented meteorological towers.

Mobile Acoustic Source (MOAS)

The MOAS is a pneumatic loudspeaker system that allows scientists to verify acoustic models with atmospheric effects. The system is a true exponential horn, 56-ft long, with full fidelity from 10 to 500-Hz; it will generate sound sufficient for testing acoustic propagation of sources up to 15-km away. Other features include the following: (1) it is transportable, mounted on an expandable flatbed trailer, (2) it can develop 20,000 acoustic watts of power, or over 160-dB, and (3) it may be controlled via radio-frequency link and fail-safe software to ensure safe operation. The MOAS can reproduce realistic signals simulating any sound at various ranges and under controlled conditions, and it can broadcast single tones, multiple tones, or tape playbacks. No other system with comparable features exists in the world today.

Electromagnetic Analysis Facility (EMAF)

This facility conducts full-scale investigations of the vulnerability of weapon systems to electronic warfare, including radio frequency countermeasures (RFCM), millimeter-wave countermeasures, and high-power microwaves (HPM). Electromagnetic susceptibility experiments use three anechoic chambers: the primary investigation anechoic chamber, a 94-ft long, 32-ft wide, and 25-ft high chamber; and two smaller chambers, one used for RFCM and one for millimeter-wave CM. Featuring externally modulated high-power amplifiers, the EMAF offers the capability to continuously sweep from 100-MHz to 18-GHz and to generate pulsed RF of up to 1-MHz and pulsed waves from 50-ns to continuous-wave. The facility can also generate AM, FM, and noise-modulated RF environments to expose the system under investigation to a comprehensive set of conditions that may be encountered in a battlefield. Resident state-of-the-art computational resources are available to provide equipment automation and real-time data analysis and storage. Also featured is a computer-controlled RF-threat emulator that provides complex high-fidelity single RF-threat radar waveforms for the RFCM investigations.

Electro-Optical Countermeasures Missile Flight Simulation Facility

This hardware-in-the-loop missile flight simulator evaluates the effectiveness of EO air defense missile systems in CM environments. The simulator includes major portions of actual missile-guidance and control hardware with software embedded in the simulation loop. Real-time representations are solved, using both digital and analog computers, for missile dynamics in six degrees of freedom and target motion in three degrees of freedom. A multiprocessor digital computer solves the missile aerodynamics and propulsion and the relative target-missile geometry. The analog computer models subsystems with bandwidths too high to allow real-time digital solution, such as the wing servo or gyro transfer function. A second digital computer functions as the simulation controller and supervises the real-time trajectory and field-of-view displays hosted on two PCs. The primary output from the simulation is miss distance at the point of closest approach to the target, a criterion from which the overall effectiveness of a CM technique may be assessed. Further processing of the miss distance into a digital end-game model can yield probability of hit (i.e., missile lethality) against specific threat aircraft.

EQUIPMENT/FACILITIES (continued)**Electro-Optical Data Acquisition System (EODATS)**

The EODATS provides a unique capability of dynamically tracking and measuring target signatures during EW missile firing experiments. It consists of a 35-ft instrumentation van integrated with an automated tracking pedestal capable of controlling the operation of six electro-optical missile seekers in a captive track arrangement. Data collected from the captive seekers can be recorded for post-mission analysis. Video documentation of seeker responses to the EOCM environments aids quick-look analysis. The EODATS is equipped with infrared through ultraviolet spectrometers, radiometers, and imagers to obtain signatures of targets, countermeasures, and backgrounds. Automatic target tracking is achieved with a highly modified Chaparral AN/DAW-1B missile seeker or digital/analog outputs from the control computer. Manual target tracking is also available via a joy stick that operates the track mount (either remotely or directly by telescope optics). The motion of the track mount during a data run can be recorded to a computer file, which can be played back through the track mount to collect background signature data across the same path. The signature measurements of the background can then be subtracted from the target-plus-background data file to achieve target-only measurements. Acoustic/Seismic Countermeasure Vehicle ARL operates a modified 5-ton stake-bed truck that can evaluate acoustic and seismic countermeasures by functioning as an acoustic/seismic decoy and an acoustic jammer. The vehicle houses an acoustic loudspeaker system, consisting of a 12-kW power generator, subwoofer cabinets, and power amplifiers, that can reproduce any signal within a frequency range of 40 to 200-Hz. The vehicle also tows a 750-lb tank sprocket used to generate seismic energy that produces spectral lines similar to those of ground combat vehicles but at a smaller magnitude. To simulate a moving ground vehicle target, the vehicle radiates a pre-recorded target signature as it travels along the ground. To simulate an acoustic jammer, it radiates broad-band noise designed to protect accompanying target vehicles by masking their acoustic signatures. The vehicle is currently being used to examine the effects of decoying and jamming on the Wide-Area Mine System - a system that relies on the acoustic and seismic energies emanating from a ground combat vehicle to engage it as a target.

Air Defense Electronic Warfare Facility

This laboratory provides ARL with a quick-reaction capability for the implementation of EW techniques to ensure that all elements of the EW threat required for the vulnerability assessment process are addressed. Specialized hardware is developed and fabricated at this facility for the field experiments associated with surveillance, tracking, and guidance functions of Army systems. The facility supports a wide variety of special-purpose equipment, including airborne and ground-based RF jammers, EOCM equipment, passive RFCM equipment, and state-of-the-art field measurement systems. Although primarily developed to support EW vulnerability analyses, these resources have wide application and are routinely used by the other services as well as the international community.

Ultra Wideband (UWB) Synthetic-Aperture Radar (SAR) Testbed

This roof-top facility provides the capability to collect precise, repeatable SAR data to perform target detection and recognition studies suitable for implementation in an airborne SAR and to test the performance of various radar components. It features a rail-guided, robotically controlled cart that supports the radar on a 115-m laser-leveled-and-aligned track. The current radar system is a fully polarimetric UWB mechanization with an operating frequency range from 40-MHz to 1-GHz. The testbed also features a position-measurement system that defines and records the position of the radar system to generate high-resolution radar imagery of stationary targets in the clear and those embedded in foliage during seasonal changes. These data are used in developing automatic target recognition (ATR) algorithms. A mobile UWB SAR testbed, featuring a 150-ft measurement system, is being built to support vehicle-mounted ground-penetrating radar developments, including mine detection systems. The UWB radar on a 150-ft boom lift allows for collection of two-dimensional apertures to support three-dimensional image formation for improved target detection and identification.

EQUIPMENT/FACILITIES (continued)**Millimeter-Wave Instrumentation Test Facility**

Here, specialists conduct basic research in propagation phenomena, remote sensing, and target signatures over the frequency range from 8 to 300-GHz. The facility is unparalleled in the breadth and depth of its instrumentation and analysis capability. Components and test equipment are available that can be readily configured for conducting feasibility studies of sensor concepts. Supporting tools include high-speed data acquisition and analysis systems, visualization tools, and model generation for performance evaluation. Through a synergistic relationship with the U.S. Army Combat Systems Test Activity (CSTA), ARL can conduct range testing using this facility with a minimum of in-house resources.

Acousto-Fluidic Test Facility

At this location, a full acoustic anechoic chamber allows the study of fluidic sensors, fluidic signal processors, and other microphone systems. Fluidic microphones, with a flat bandwidth down to a true zero hertz (DC), can be configured to be more sensitive than any commercially available microphone. In addition to the research being conducted on these fluidic microphones, they can also be used as a research tool for other programs requiring increased sensitivity and nonelectronic acoustic sensing. The chamber is anechoic pro.

Army Research Laboratory
Adelphi, MD 20783-1197
(301) 394-1067

Director: Dr. John W. Lyons
Dep. Director: Mr. Bruce M. Fonoroff

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	27.029	0.147	39.655	66.831
6.2	90.639	0.167	45.066	135.872
6.3	11.717	0.033	9.006	20.756
Subtotal (S&T)	129.385	0.347	93.727	223.459
6.4	2.864	0.008	2.201	5.073
6.5	2.242	0.006	1.723	3.971
6.6	47.611	5.166	36.840	89.617
6.7	0.168	0.006	1.642	1.816
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	182.270	5.533	136.133	323.936
Procurement	2.207	NA	1.692	3.899
Operations & Maintenance	4.982	NA	11.094	16.076
Other	45.552	NA	10.387	55.939
TOTAL FUNDING	235.011	5.533	159.306	399.850

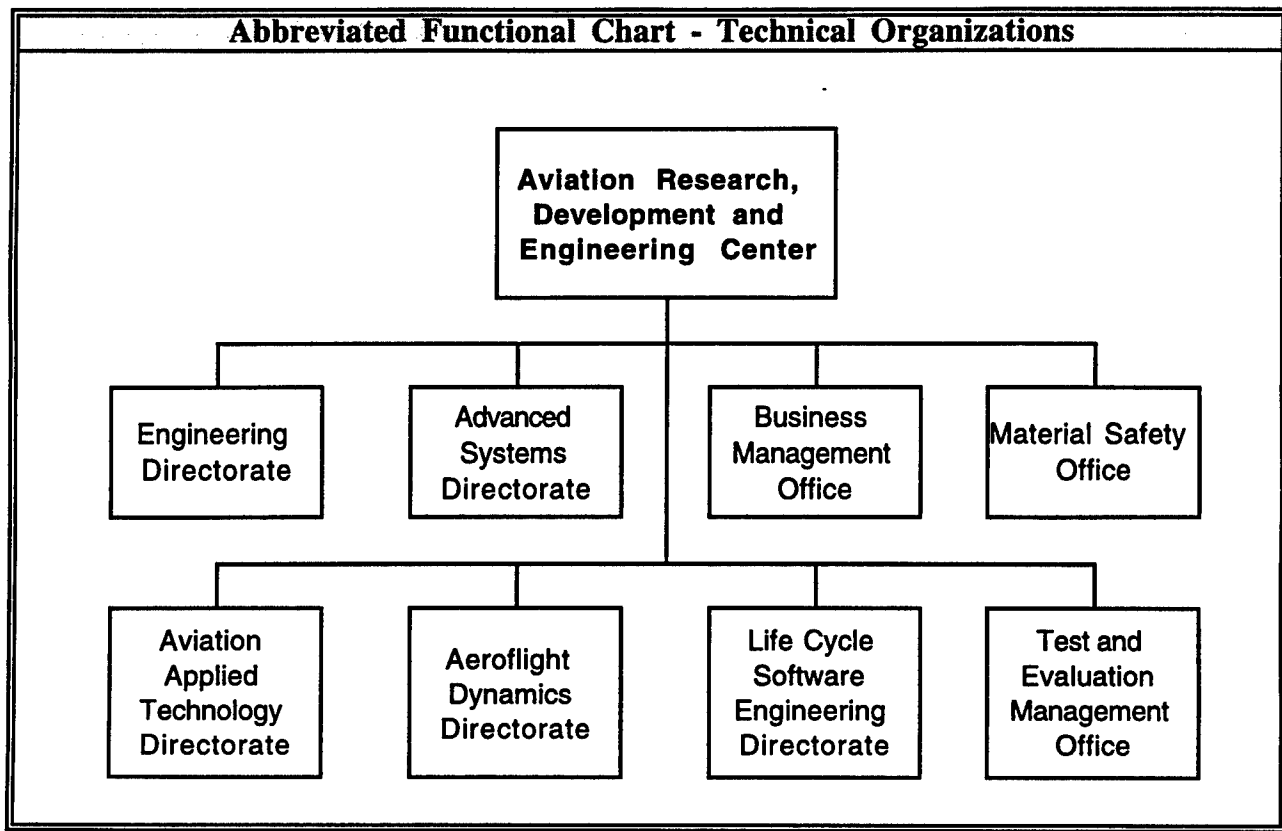
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	96.618

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	3	25	31	59
CIVILIAN	316	965	959	2,240
TOTAL	319	990	990	2,299

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,250.000	REAL PROPERTY	697.000
ADMIN	864.000	* NEW CAPITAL EQUIPMENT	49.000
OTHER	673.000	EQUIPMENT	561.587
TOTAL	2,787.000	* NEW SCIENTIFIC & ENG. EQUIP.	60.728
ACRES	5,335	* Subset of previous category.	

NA = Not Applicable

Aviation Research, Development and Engineering Center



Aviation Research, Development and Engineering Center

St. Louis, MO 63120-1798
(205) 842-9641

Commander: MG Emmett E. Gibson
Executive Dir: Thomas L. House

MISSION

Execute the DoD Rotorcraft Science and Technology program and provide 'one-stop' engineering support to all life cycle phases as required to achieve technologically superior, safe, and supportable Army aviation systems and equipment. The AVRDEC has the responsibility to plan and, in most cases, execute the fundamental basic research, exploratory development, and advanced development programs supporting DoD rotorcraft needs in the areas of aeromechanics, propulsion, structures, reliability and maintainability, survivability, weaponization, avionics mission equipment, and systems integration/simulation.

CURRENT IMPORTANT PROGRAMS

Rotorcraft Pilot's Associate; Joint Turbine Advanced Gas Generator and Integrated High Performance Turbine Engine Technology; Advanced Rotorcraft Transmission; Air-to-Air Starstreak Integrated Advanced Boresight Equipment; Integrated Fire and Flight Control, Advanced Cargo Handling System; Airborne Manned/Unmanned Systems Technology; Unit Maintenance Aerial Recovery Kit; Advanced Composite Structural field repair NDI/NDT; Rotary Wing Structures Technology, Light Weight, High temperature Uncooled Turbine; visual Electro-Optical Signature.

Current CRADAs include:

Flight Dem of a Helicopter Automatic Cannon Air-to-Air Gun Turret - McDonnell Douglas Helicopter

Materials Characteristics of Composite Rotor Blades - Advanced technologies, Inc.

Ballistic testing of Helicopter Composite drive shafts - Boeing Defense and Space Group

Evaluation of Articulated Boresight Equipment - Cubic Precision

Black Hawk Growth Rotor Evaluation - Sikorsky Aircraft

Associate Cockpit Technology - Sikorsky Aircraft

Appl of Human Factors Research to Short haul Civil Tiltrotor - Boeing Defense and Space Group

Aero and Structural Computer models for AH-64D Helicopter - McDonnell Douglas Helicopter

Collaborative Army Industry Rotorcraft Technology Exchange - Boeing Defense and Space Group

Collaborative Army Industry Rotorcraft Technology Exchange - Sikorsky Aircraft

Impossible Navier-Stokes CFD analysis to Predict Fuselage Drag - Sikorsky Aircraft

AI Technology and Sensors to Army Air and Ground Vehicles - Aerobotics Corporation

Application of Conduit Control System Design Tool with Bell Helicopter

Comprehensive Identification from Frequency Response (CIFER) with Kaman Aerospace and Carnegie Mellon Robotics Institute.

EQUIPMENT/FACILITIES

Crew Station Research and Development Facility: three blue/red team stations; fiberoptic helmets; one or two seat standard cockpit; Mission Equipment Simulation Evaluation Facility (MESEF) Cockpit; technical center can simulate 11 other aircraft, 99 threats, 20 moving targets, and C3.

Flying Laboratory for Integrated T&E (FLITE): modified AH-1S aircraft; Apache PNVs; reconfigurable voice I/O system; flight symbolot; fully integrated instrumentation.

NASA-Ames Vertical Motion simulator: four interchangeable cabins with virtual TV display; six DOF motion, acceleration, and velocities; sound generation system; pilot and co-pilot positions.

NASA-Ames Helicopter Human Factors Research Facility: four part-task simulators to investigate; geographic orientation, visual cues simulator, voice actuated controls, and pilot decision-making.

NASA-Langley 14x22 Wind Tunnel: VSTOL/200 knots/variable test section; flow visualization and diagnostics; acoustics capability.

Infra-Red Suppressor Facility: IR suppression fabrication shop; engine and test stand with indoor and outdoor test ranges; Sun workstation and software for: test data recording and analysis, and design and simulation of IR suppressors.

Ballistic Test Range: two outdoor and one indoor test range: fully instrumented for data collection and analysis; fuel recovery system; API and HEI up to 30mm in caliber. Experimental fabrication facility. Full scale aircraft and component structural test facility.

NASA-Ames 40x80x120 Wind Tunnel: NASA-Ames 7x10 Wind Tunnel; NASA-Ames Automation Sciences Research Facility; NASA-Ames Numerical Aerodynamics Simulator; NASA-Ames Fluid Mechanics Laboratory; NASA-Ames Hover Anechoic Chamber.

Aviation Research, Development and Engineering Center

St. Louis, MO 63120-1798

(205) 842-9641

Commander: MG Emmett E. Gibson

Executive Dir: Thomas L. House

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	1.424	NA	NA	1.424
6.1 Other	1.500	0.000	2.300	3.800
6.2	17.684	0.000	16.856	34.540
6.3	7.286	0.000	48.882	56.168
Subtotal (S&T)	27.894	0.000	68.038	95.932
6.4	1.558	0.000	3.623	5.181
6.5	0.000	0.000	0.000	0.000
6.6	8.887	0.000	8.978	17.865
6.7	0.548	0.000	10.221	10.769
Non-DOD	0.140	0.000	0.000	0.140
TOTAL RDT&E	39.027	0.000	90.860	129.887
Procurement	0.000	NA	0.752	0.752
Operations & Maintenance	19.297	NA	9.022	28.319
Other	9.140	NA	3.921	13.061
TOTAL FUNDING	67.464	0.000	104.555	172.019

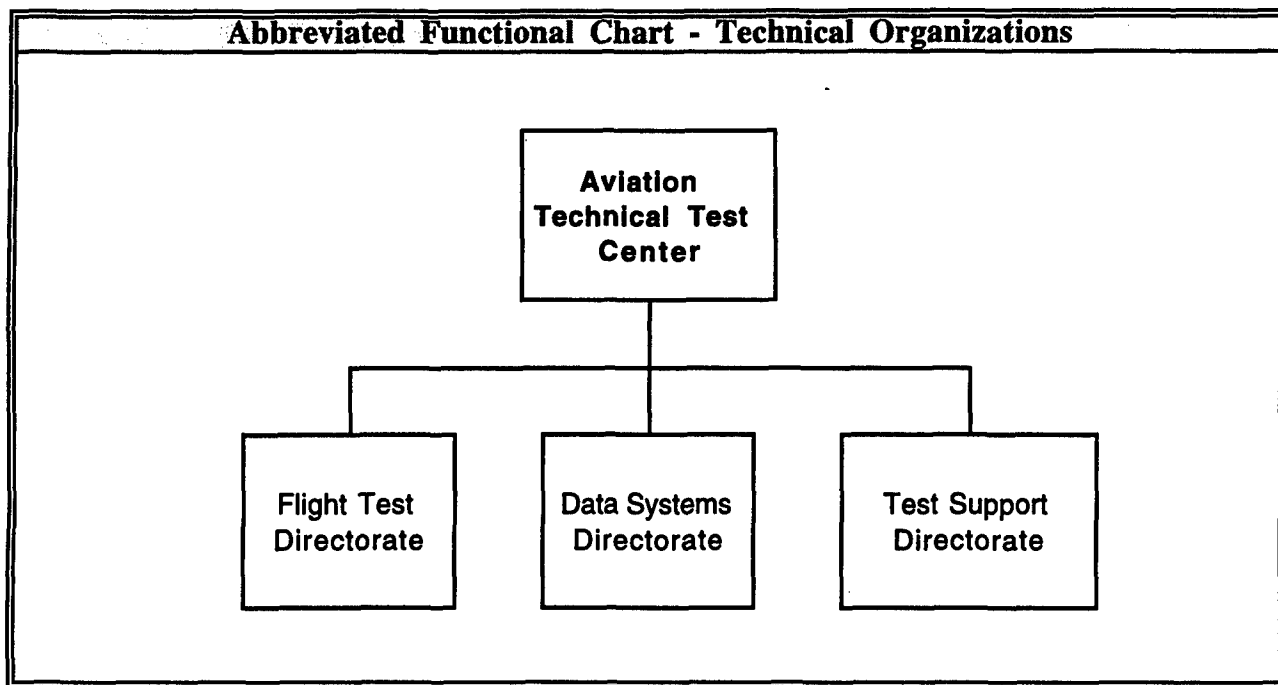
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	14	14
CIVILIAN	23	182	253	458
TOTAL	23	182	267	472

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	109.000	REAL PROPERTY	6.652
ADMIN	64.000	* NEW CAPITAL EQUIPMENT	0.050
OTHER	15.000	EQUIPMENT	27.796
TOTAL	188.000	* NEW SCIENTIFIC & ENG. EQUIP.	1.399
ACRES	0	* Subset of previous category.	

NA = Not Applicable

Aviation Technical Test Center



Aviation Technical Test Center
Fort Rucker, AL 36362-5276
(334) 255-8000

Commander: COL Jack O. Shafer, Jr.
Tech Dir: Larry E. Eagerton

MISSION

Plan, conduct, analyze, and report the results of developmental tests and studies to include airworthiness flight testing of Army aviation systems and associated materiel/systems. To provide test, test support, development support, and evaluations of aviation materiel/systems; and provide other aviation support for authorized customers as directed by the U.S. Army Test and Evaluation Command.

CURRENT IMPORTANT PROGRAMS

AH-64D Long Bow

RAH-66 Comanche Program

Special Operations Aircraft Program

OH-58D Kiowa Warrior

T801 Engine Conversion for National Guard

EQUIPMENT/FACILITIES

Twenty six rotary and fixed-wing aircraft are currently assigned (1 AH-1F, 4 AH-64A, 3 CH-47D, 1 C-23A, 1 OH-58C, 2 OH-58D, 3 UH-1H, 5 UH-60A, 1 UH-60L, 1 U-21H, 2 T-34C, 1 EH-60A, 1 C-12F) as test beds. Helicopter Icing Spray System (HISS): a CH-47D with an integrated 1,800-gallon water tank and spray apparatus combined with a highly instrumented U-21A to provide cloud physics documentation, conducts in-flight icing evaluations under both artificial and natural conditions. Full flight test instrumentation capability exist. Analog and digital aircraft data can be recorded and/or telemetered to the ground. On-site data processing and display exist--real time and postmission. Capability to collect and process video, still, and high-speed pictures exists.

Aviation Technical Test Center
Fort Rucker, AL 36362-5276
(334) 255-8000

Commander: COL Jack O. Shafer, Jr.
Tech Dir: Larry E. Eagerton

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	9.838	0.000	0.000	9.838
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	9.838	0.000	0.000	9.838
Procurement	0.600	NA	0.000	0.600
Operations & Maintenance	0.001	NA	0.000	0.001
Other	1.536	NA	0.000	1.536
TOTAL FUNDING	11.975	0.000	0.000	11.975

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

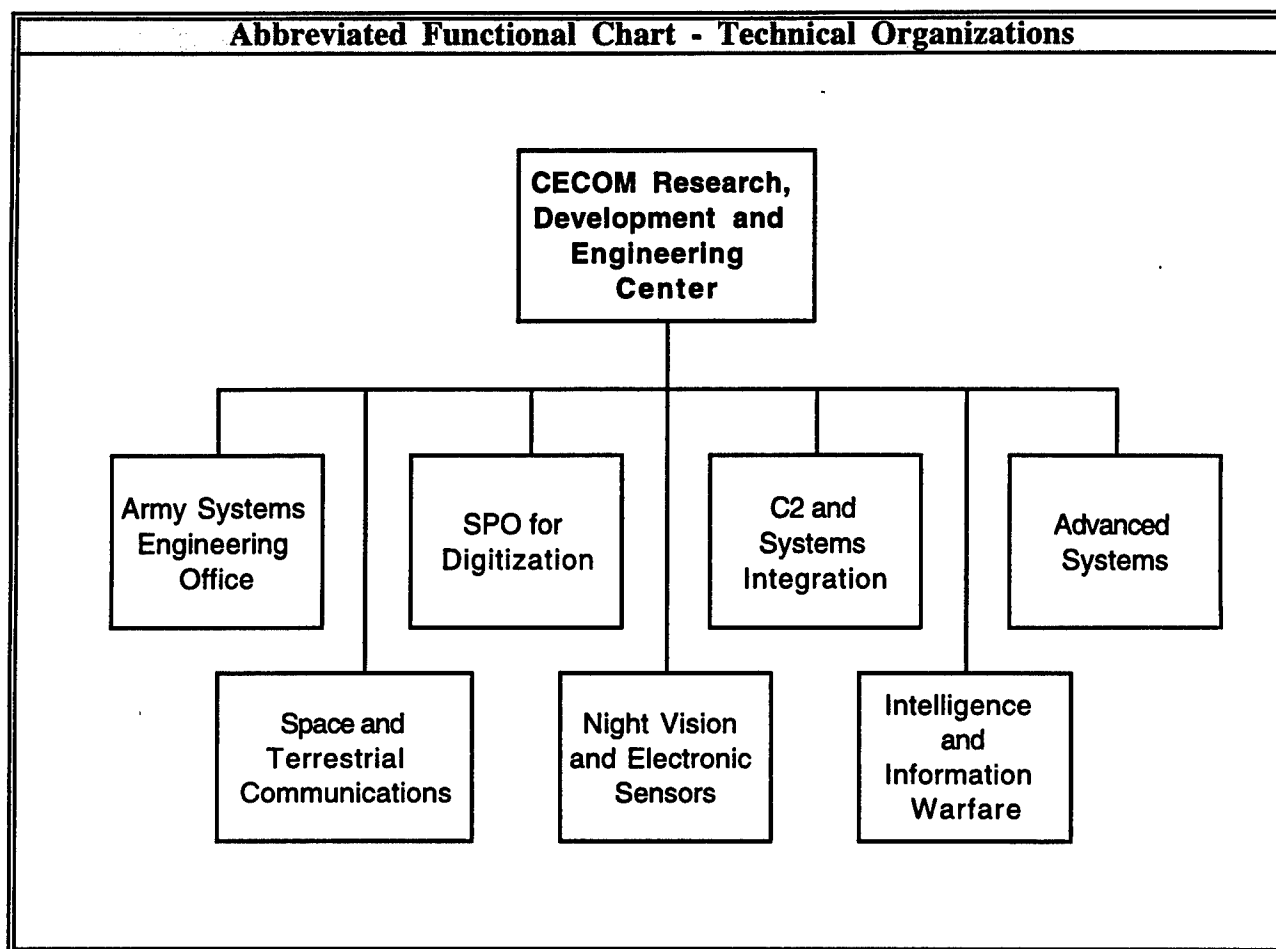
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	26	9	35
CIVILIAN	0	37	65	102
TOTAL	0	63	74	137

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	0.000	REAL PROPERTY	2.800
ADMIN	77.633	* NEW CAPITAL EQUIPMENT	0.000
OTHER	125.004	EQUIPMENT	117.978
TOTAL	202.637	* NEW SCIENTIFIC & ENG. EQUIP.	0.444
ACRES	11,005	* Subset of previous category.	

NA = Not Applicable

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CECOM Research, Development & Engineering Center



CECOM Research, Development & Engineering Center

Ft. Monmouth, NJ 07703-5209

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Director: Dr. Louis C. Marquet
Military Deputy: COL Robert Fasulo**MISSION**

The Communications-Electronics Command (CECOM) Research, Development and Engineering Center (CERDEC), headquartered at Fort Monmouth, New Jersey, is the AMC Center for research, development and engineering in Command and Control, Communications, Computers and Intelligence (C4I); Information Warfare/Information Operations; Electronic Warfare; Night Vision and Electro Optics; Countersurveillance; Countermines; Power Sources; and Avionics. The CERDEC's mission is focused on providing support to the Program Executive Officers (PEOs) and Project Managers (PMs) and other customers; managing technology base programs by defining, developing and acquiring superior technologies; developing, acquiring, testing and evaluating non-major systems; and sustaining and enhancing systems and equipment for a trained and ready Army undergoing revolutionary changes.

CURRENT IMPORTANT PROGRAMS

Direct Broadcast Satellite (DBS) - The CERDEC is developing and demonstrating military applications of commercially available technology in the broadcasting of imagery, data and other information via the DBS system. DBS is a new commercial technology utilizing high power satellites to transmit digital signals to small, inexpensive receivers. Compression techniques enable data rates sufficient to transmit motion video, databases and other digital information. Program evolves to provide an in-theater capability using airborne relays to reduce dependence on commercial satellites as well as development of a mobile uplink system.

Global Mobile Information Systems (GLOMO) - CERDEC efforts will develop a set of "Density and Asymmetry-Adaptive Wireless Networking" (DAWN) mechanisms which will provide flexible, survivable and scalable solutions to solve problems in several crucial GLOMO communications areas. These areas include network connectivity, routing scalability, jammer vulnerability, endpoint affiliation and virtual circuit formation.

Multi-Function Staring Sensor Suite (MFS3) Advanced Technology Demo (ATD) - Demonstrate a modular, re-configurable MFS3 utilizing sensor fusion and integrating multiple advanced sensor components including staring infrared arrays, multifunction laser, and acoustic arrays. The MFS3 will provide ground vehicles and surface ships with a compact, affordable sensor suite for long range non-cooperative target identification, low signature target acquisition, mortar/sniper fire location, and air defense targeting against low signature UAVs and long range helicopters.

Integrated Sensor and Targeting (ISAT) - Demonstrate HTI FR, missile and laser warning upgrades to the AN/ALQ-211 and -212, and AVR-2A that provides precision hostile situation awareness, target acquisition and geo-location plus combat ID assist for active emitters.

Lightweight, Airborne Multi-Spectral Countermines Detection System - Explore innovative concept and technology to support a lightweight, airborne stand-off mine detection capability for limited area (point) detection, limited corridor route reconnaissance and detection of nuisance mines along road. Investigate a variety of new component and focal plane array technologies such as 3-5 Staring FPAs, multi/hyper-spectral, passive polarization, active sources and electronic stabilization to support a lightweight, limited capability for future tactical UAVs.

CURRENT IMPORTANT PROGRAMS (continued)

Doppler/Global Positioning System (DGNS) Navigation Set - The DGNS consists of a production Lightweight Doppler Navigation Set, ASN-128 with a single card GPS receiver embedded inside the LDNS Signal Data Converter. First Article Tests successfully demonstrated stated/required objectives of functionality and performance.

Tactical Command and Control Protect Advanced Technology Demonstration - Develop, integrate, and validate hardware, software tools, tactics, techniques, and procedures that will secure the systems and networks of the Tactical Internet and the First Digitized Division.

Technology Transfer:

CERDEC, together with the NJ Commission on S&T, formed the Information Technology Innovation Center (ITIC). It will electronically connect CECOM's Digital Integrated Lab/Testbed to regionally based university technology centers and state sponsored incubators to provide a platform for innovation "incubation" efforts.

CERDEC hosted a Small Business Outreach Symposium which provided info on enabling small business R&D through tech leveraging, partnering and incubation and dual use technology innovation.

Promoted the development of partnerships with industry and academia to develop CERDEC core technologies through print and internet.

CERDEC has a Cooperative R&D agreement with Charles Stark Draper Lab to develop the Synchronized Course of Action Authoring Tool (SCAT). Draper has taken some interesting approaches around the pixel problem associated with presenting map info on less than desirable pixel densities.

EQUIPMENT/FACILITIES

The CERDEC boasts many world-unique and U.S. Government-unique facilities supporting a broad range of technical areas. A sampling of our state-of-the-art equipment and facilities follows.

Intelligence and Information Warfare Facility. This year, CERDEC opened its new R&D facility which houses the Automated Data Processing Lab/Common Ground Station, Anechoic Chamber and the System Integration Lab. The facility has limited access and Sensitive Compartmented Information Facility (SCIF) areas. It has enabled the CERDEC to expand our world-class R&D capabilities in the areas of signal intelligence, electronic jamming, meteorology sensing and electronic countermeasures.

The Digital Integrated Laboratory/Testbed is a dynamic world-class integrated facility that electronically links distributed CERDEC labs, industry facilities, Battle Labs, field sites, and joint activities. The DIL/T can be rapidly reconfigured to replicate diverse existing and evolving tactical C4I/I2W battlefield environments for systems engineering, development, integration, and evaluation of the digital battlefield. The Army Digitization Office has mandated that all equipment and technology to be used in the Digital Battlefield must be tested and/or run through the DIL/T.

Signal Analysis Laboratory. This lab is the only U.S. in-house source of the critical signal processing required for technology development of highly classified signals and for rapid analyses and responses to changing threats emerging from areas of high national interest. The central facility combines hardware and software capabilities for signals analysis and waveform measurement. Some of the lab equipment has unparalleled capability in either government or industry.

EQUIPMENT/FACILITIES (continued)

Power Sources Battery Test Facility. This facility performs safety, performance, quality and reliability tests on state-of-the-art power sources for the Army. Everything from developmental prototypes to high volume production samples can be tested to include all types of primary and rechargeable batteries, hybrid power sources, fuel cells and thermophotovoltaic devices.

Survivability Integrated Laboratory (SIL). The SIL is an integrated assemblage of survivability hardware (production and developmental), simulation, stimulation and emulation devices that allow for the analysis and evaluation of electronic warfare systems in a multi-spectral environment. The SIL's objectives include determining the optimum survivability suites for ground and air platforms, verifying new countermeasure techniques and establishing the military worth of new concepts and development efforts.

CECOM Research, Development & Engineering Center
 Ft. Monmouth, NJ 07703-5209
 (732) 427-2686

Director: Dr. Louis C. Marquet
 Military Deputy: COL Robert Fasulo

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	1.770	NA	NA	1.770
6.1 Other	1.038	0.214	0.440	1.692
6.2	27.108	5.223	42.865	75.196
6.3	24.112	5.201	110.971	140.284
Subtotal (S&T)	54.028	10.638	154.276	218.942
6.4	9.546	7.093	10.514	27.153
6.5	3.637	2.162	6.024	11.823
6.6	4.885	0.512	25.854	31.251
6.7	6.008	3.624	9.232	18.864
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	78.104	24.029	205.900	308.033
Procurement	18.387	NA	43.748	62.135
Operations & Maintenance	12.027	NA	20.416	32.443
Other	3.809	NA	50.645	54.454
TOTAL FUNDING	112.327	24.029	320.709	457.065

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	7	28	35
CIVILIAN	76	1,303	718	2,097
TOTAL	76	1,310	746	2,132

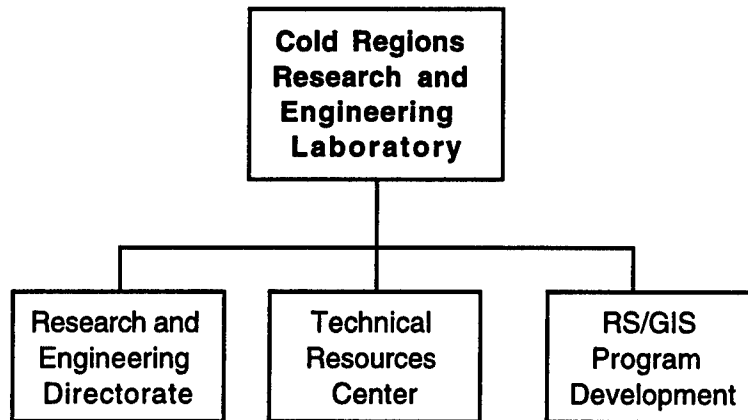
SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	323.078	REAL PROPERTY	79.600
ADMIN	395.052	* NEW CAPITAL EQUIPMENT	0.150
OTHER	111.106	EQUIPMENT	285.307
TOTAL	829.236	* NEW SCIENTIFIC & ENG. EQUIP.	20.600
ACRES	1,140	* Subset of previous category.	

NA = Not Applicable

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Cold Regions Research & Engineering Laboratory

Abbreviated Functional Chart - Technical Organizations



Cold Regions Research & Engineering Laboratory

Hanover, NH 03755-1290
(603) 646-4100

Commander/Director: LTC Mark Nelson
Acting Chief: CPT(P) Gene Griffin

MISSION

Advancing knowledge of the cold regions through scientific and engineering research and putting that knowledge to work for the Army, Department of Defense and the Nation is the mission of the U.S. Army Cold Regions Research and Engineering Laboratory (USACRREL). Operating in cold regions requires appropriate equipment, training and doctrine, often very different from those used in more temperate conditions. These special requirements cover a broad range of military activities and can incur significant cost or capability penalties. Special challenges of cold regions exist on the more than 30% of the earth's surface that is covered by ice or underlain with permafrost. In addition, persistent and severe winter conditions occur in 50% of the earth's surface, including areas of Europe, Asia and North and South America. Bosnia/Herzegovina and North and South Korea are areas of interest today that experience severe winter conditions that are significantly impacting military operations.

USACRREL provides the technology to allow the Army to operate effectively in cold regions environments to maintain national security and foster peace. USACRREL research and development (R&D) focuses on all aspects of the cold/winter environment and its implications for military activities in garrison or on the battlefield; the singular exception being individual soldier clothing and equipment. CRREL also addresses the nations winter water resources issues through the Civil Works program of the Corps of Engineers.

USACRREL is a single-focused R&D organization that is the primary source of cold regions expertise for the Department of Defense and both serves and leverages resources and efforts of other federal, state, and local agencies and the private sector.

CURRENT IMPORTANT PROGRAMS

USACRREL's current military programs are concentrated in four major research and development areas: Military Engineering, Battlespace Environments, Civil Engineering, and Environmental Quality.

The Military Engineering research provides innovative solutions to the difficult engineering problems that soldiers face in winter within the confines of existing and emerging equipment and manpower resources. This work is accomplished in conjunction with the primary materiel developer or with troop units to assist in focusing the research and provide direct transition and feedback. Focus areas are winter combat engineering, mobility, and operability. This research serves the cold regions requirements of all the military services and is directly relevant to current Army activities in Korea and Bosnia.

The Battlespace Environments research supports the design, test and evaluation of new systems through characterization, modeling and simulation of the highly varied world environmental conditions and their impact on systems (fielded or notional) performance. Winter and cold regions conditions are particularly difficult constraints for systems development and operation. Examples of direct support include icing problems for aircraft, modeling and simulation of the background environment and its impact on smart weapons systems, mine/countermine systems, and the ability to project environmental conditions in denied areas.

CURRENT IMPORTANT PROGRAMS (continued)

The Civil Engineering research generates technology for cost reductions in designing, building, operating, and maintaining military facilities in areas that experience harsh winter and severe cold weather; where infrastructure life-cycle costs and energy costs are high. USACRREL's efforts help solve critical Department of Defense civil engineering problems related to training, mobilizing, deploying, sustaining, protecting, and employing U.S. Forces in the cold environment.

The Environmental Quality research supports the test and evaluation of materiel systems through maintenance of training and test ranges, allowing their continued use while conserving the integrity of the environment. This is an especially difficult problem for ground vehicles and weapons systems that can have dramatic impacts on the flora and fauna of military ranges. The environmental quality area also has close ties to the Battlespace Environments area because of their common need for characterization and quantification of the geophysical processes that govern both the impact of the operating environment on military operations and systems, and the impact of activities on the quality of the natural environment. USACRREL research supports restoration and conservation goals focusing on special constraints imposed by winter conditions and cold climates.

USACRREL's current Civil Works programs are concentrated in three major research and development areas: Remote Sensing (RS), Geographic Information Systems (GIS), and Cold Regions Engineering.

The RS and GIS research programs support the development of oil spill and flood mapping. Support is also provided by conducting large area environmental assessments critical to emergency response efforts.

The Cold Regions Engineering research program addresses inland navigation, flood damage reduction, and water resource problems in cold regions. This program provides knowledge and mitigating solutions in the areas of ice on inland navigation, operation and maintenance of structures, river ice jams and related floods, ice hydraulics, ice damage to shorelines and shore structures, and hydrology and water resources of cold regions.

EQUIPMENT/FACILITIES

USACRREL has a complex of low temperature laboratories and experimental research facilities not found anywhere else in the world. The main laboratory consists of 24 low temperature research laboratories with a temperature range down to -50 degrees F. The 73,000 square foot Ice Engineering Facility houses three special-purpose research areas; a large low-temperature towing tank, a 100-foot long refrigerated flume for modeling rivers, and a large hydraulic-model room for studying ice impacts on civil works facilities, primarily locks and dams. The 29,000 square foot Frost Effects Research Facility (FERF) supports full-scale research on the impact of freeze-thaw cycles on pavements, foundations, and utility systems. The nationally unique FERF facility provides the capability to simulate natural 3-D freeze-thaw cycles to support research on the impact of these cycles on pavements, foundations, and utility systems. The unique 9000 square foot Low Temperature Materiel Test Facility provides additional capability to investigate composite materials performance subject to low-temperature and thermal cycling for potential use for future Army armor vehicles. USACRREL also has access to two permafrost research sites in Alaska.

In addition, USACRREL houses the 16,400 square foot Corps of Engineers' Civil Works Remote Sensing/Geographic Information System Center, and a state-of-the-art Department of Defense Cold Regions Technical Information Analysis Center (CRSTIAC). The 24,000 square foot CRSTIAC facility is home to the most comprehensive collection of cold regions science and engineering data in the world.

Cold Regions Research & Engineering Laboratory

Hanover, NH 03755-1290
(603) 646-4100

Commander/Director: LTC Mark Nelson
Acting Chief: CPT(P) Gene Griffin

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.220	NA	NA	0.220
6.1 Other	1.523	0.031	0.236	1.790
6.2	4.113	0.084	1.085	5.282
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	5.856	0.115	1.321	7.292
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	5.495	0.112	0.532	6.139
6.7	2.081	0.042	1.496	3.619
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	13.432	0.269	3.349	17.050
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	4.413	NA	1.582	5.995
Other	9.864	NA	1.699	11.563
TOTAL FUNDING	27.709	0.269	6.630	34.608

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

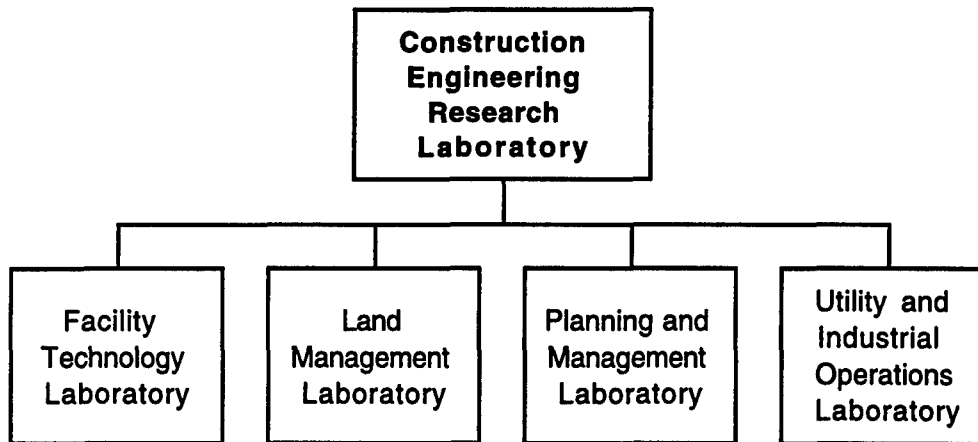
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	0	0
CIVILIAN	33	58	150	241
TOTAL	33	58	150	241

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	242.200	REAL PROPERTY	3.200
ADMIN	2.400	* NEW CAPITAL EQUIPMENT	1.600
OTHER	66.400	EQUIPMENT	0.000
TOTAL	311.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	207	* Subset of previous category.	

NA = Not Applicable

Construction Engineering Research Laboratories

Abbreviated Functional Chart - Technical Organizations



Construction Engineering Research Laboratories
Champaign, IL 61826-9005
(217) 373-6714

Director: Dr. Michael J. O'Connor
Commander: COL James A. Walter

MISSION

OCE General Orders 17, 9 Sep 68, established USACERL as a Separate Field Operating Agency (SFOA) under the Chief of Engineers. By OCE General Orders 16, 20 May 74, USACERL was placed under the staff supervision of the USACE Research and Development Directorate. ER 10-1-26 assigns USACERL the mission of performing infrastructure and environmental sustainment research, development, studies and technical assistance to maintain a quality trained and ready Army; to set the standard in preserving and protecting its land, water and natural and cultural resources; and to repair, maintain and rehabilitate Civil Works facilities. It performs research and development for enhancing engineer capability to deploy rapidly and to sustain a full range of military operations. It executes the mission through various functional elements.

CURRENT IMPORTANT PROGRAMS

Munitions Production Compliance Technologies.

Sustainable Military Land Use and Stewardship of Army Lands (Military Land Management - LMS).

Defense Environmental Network and Information Exchange (DENIX).

Facility Seismic Risk Mitigation.

Facility Delivery Process Improvement.

Smart Structural Systems.

Integrated Installation Management.

Utilities Modernization and Optimization for Military Installations.

Training Land Carrying Capacity.

Protocols for Military Training to Reduce Impact on Threatened and Endangered Species.

EQUIPMENT/FACILITIES

Triaxial Earthquake and Shock Simulator (TESS): The United States' first large triaxial shaking table is a unique dual-mode shock and vibration test facility. The TESS, in its biaxial mode, simulates a wide range of transient shock vibrations typical of military applications requiring large accelerations over a wide frequency range with moderately heavy test specimens. In the triaxial mode, it can simulate a variety of vibration environments including earthquakes and random vibrations, as well as log-sweep and resonant searches. The TESS is one of the premier seismic experimental test facilities in this country, supporting experimental research that cannot be performed by any other U.S. organization.

Ion Plating Systems: Custom-designed to meet highly specialized research specifications to do small scale prototype thin film coating experiments; only facility of this kind (plasma-assisted physical vapor disposition) in the Army.

Heating, Ventilation and Air Conditioning Test Facility: A large 'mini-facility' with four rooms (zones) that can be thermally controlled separately to replicate a variety of HVAC systems and conditions, including dual or single duct and variable or constant air volume conditions; includes ventilation system, hot water supply loops, chilled water supply loops, HVAC systems configuration, facility controls, and data acquisition system; used to validate the energy thermodynamics analysis program and to analyze performance of proposed standard digital control panels; unique within DoD.

Acoustics Lab: The Impulse Noise Technology Center is a state-of-the-art lab facility for the quantification and reduction of impulse noise from cannon, helicopters, blast and small caliber weapons firing. Contains a variety of sophisticated noise monitoring, recording, and analysis instrumentation for research on impact assessment and mitigation of impulse noise related to human annoyance and animal disturbance. Also includes a one-of-a-kind noise impedance tube for the test of noise energy absorption along surfaces.

Paint Laboratory: Specialized equipment necessary to perform Qualified Product List testing on paints used by the Army (an 'honest broker' function); capability to manufacture lab size batches of experimental coatings and perform both real-time and accelerated performance testing of coatings; capability to perform forensic analysis of paint samples.

Equipment and facilities co-located at the University of Illinois, Urbana-Champaign: In 1966, the U.S. Army Corps of Engineers proposed a new laboratory for engineering research to support military construction. In national competition in 1967, the University of Illinois at Urbana-Champaign was selected for co-locating USACERL. This unique relationship between USACERL and the University of Illinois, annually cited as one of the top three engineering schools in the nation, has been touted by HQ USACE as a prime example of 'reinventing Government.' Of approximately 650 personnel working at USACERL, over 200 are University of Illinois faculty, staff or students. Designated as an allied agency of the University of Illinois, \$250-500 million of University of Illinois research laboratory equipment is accessible.

Controlled Archeological Test Site (CATS): The CATS facility has been constructed with funding provided by the National Center for Preservation Technology and Training and will be utilized for research and training with geophysical applications in archaeology. The CATS facility replicates a range of archeological features commonly encountered in North American archaeological sites and offers a controlled environment for the application of non-destructive investigative techniques. The CATS facility will be available for research in a broad range of problems associated with archaeogeophysics such as, the effects of environmental conditions on geophysical expression, sensor type and configuration, spatial resolution, image processing and pattern recognition, operator variation, and feature variability. This research will contribute to our ability to interpret geophysical data and refine field methods for application in archeological investigations.

Construction Engineering Research Laboratories
 Champaign, IL 61826-9005
 (217) 373-6714

Director: Dr. Michael J. O'Connor
 Commander: COL James A. Walter

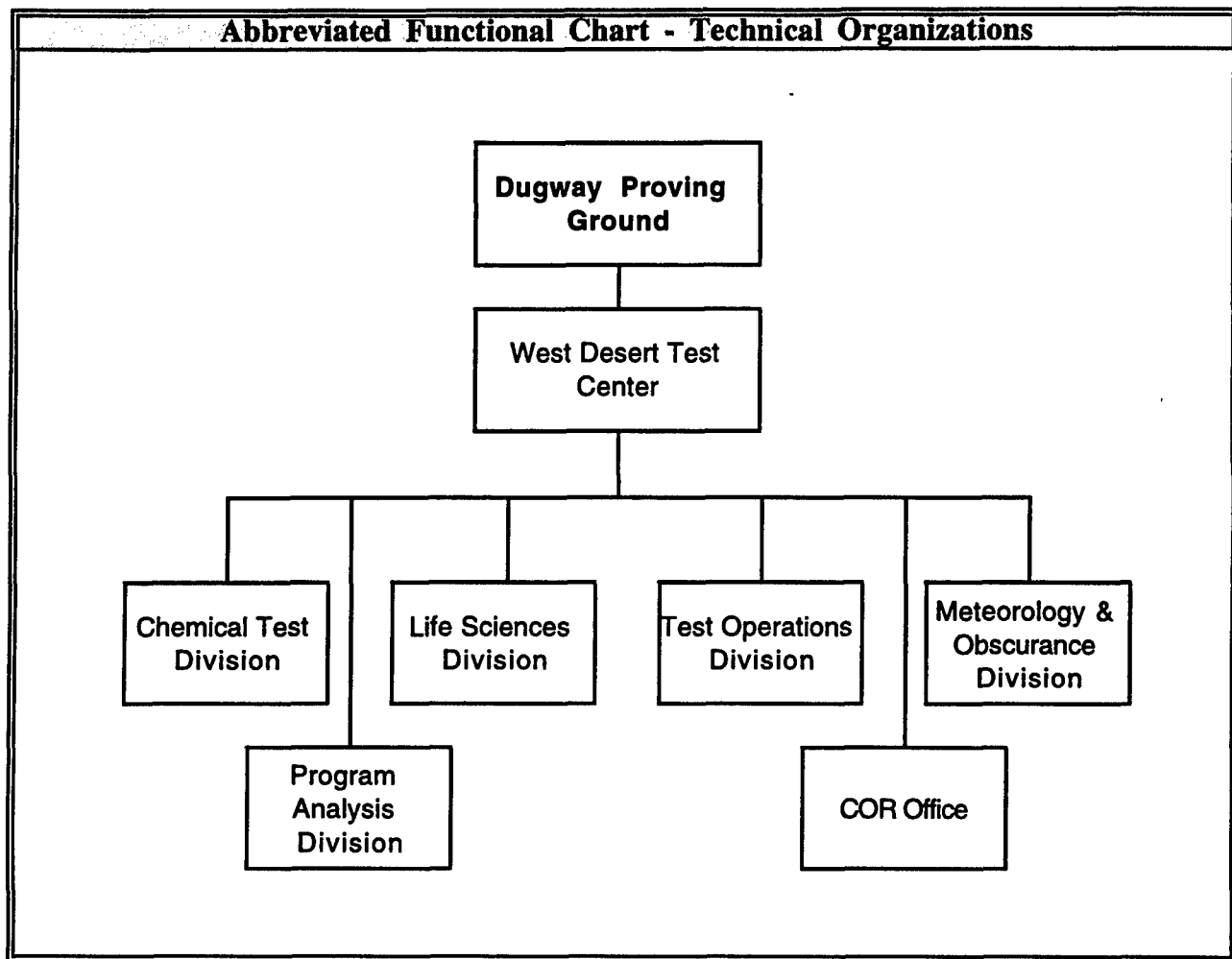
FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.066	NA	NA	0.066
6.1 Other	2.524	0.457	0.780	3.761
6.2	10.750	1.897	12.641	25.288
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	13.340	2.354	13.421	29.115
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	5.508	0.161	2.428	8.097
6.7	0.000	0.000	0.000	0.000
Non-DOD	2.451	0.432	1.216	4.099
TOTAL RDT&E	21.299	2.947	17.065	41.311
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	12.489	NA	8.343	20.832
Other	0.000	NA	0.000	0.000
TOTAL FUNDING	33.788	2.947	25.408	62.143

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	2	0	2
CIVILIAN	37	131	171	339
TOTAL	37	133	171	341

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	113.400	REAL PROPERTY	0.000
ADMIN	48.300	* NEW CAPITAL EQUIPMENT	0.000
OTHER	36.700	EQUIPMENT	16.776
TOTAL	198.400	* NEW SCIENTIFIC & ENG. EQUIP.	0.105
ACRES	33	* Subset of previous category.	

NA = Not Applicable

Dugway Proving Ground

Dugway Proving Ground
Dugway, UT 84022-5000
(435) 831-3701

Commander: COL John A. Como
Technical Director: I. Gary Resnick

MISSION

Plan, conduct, analyze and report the results of exploratory, developmental, and production tests of chemical and biological defense systems, smoke and obscurant materiel and delivery systems, and illumination systems. Operates the proving ground as a DoD Major Range and Test Facility Base (MRTFB); and operate the Center for Environmental Technology Testing. DPG is the DoD-designated Chemical and Biological Defense Test and Evaluation Reliance test site.

Test illuminating and obscuring artillery, mortars and rockets. Perform tests of all material commodities to assess chemical and biological hardness and contamination/decontamination survivability. Test procedures and by-products of chemical and conventional weapons demilitarization. Perform tests and develops procedures for on-site verification inspections for chemical weapons treaties. Dugway provides the base of operation for the Joint Services Project, Chemical and Biological Joint Contact Point and Test, which provides chemical and biological defense information and operationally oriented tests and analysis to the Services and CINCS.

CURRENT IMPORTANT PROGRAMS

Research, development and laboratory investigations. Joint-operations chemical and biological defense tests and studies for CINCS and Services. Munitions development/acceptance and production testing. Environmental studies to support DPG and Army programs.

EQUIPMENT/FACILITIES

Instrumented grids for chemical, biological and smoke/obscurant systems. Artillery range for conventional and chemical metal parts. Ballistics and dissemination tests with field sample, sample mass analysis, meteorological (auto data acquisition and MESOMET network) system. Physical and environmental test facility (MIL SPEC 810) chambers for total agent containment. Operations supported by meteorological research on behavior of clouds. Chemical, life science technology, ecological survival of DPS. Capability for planning analysis, evaluation of tests and operations research. Labs equipped for wide range of chemical, microbiological, toxicological, immunological and pollution studies. Technical and mass array of fluorescent air tracers. External-communication and range safety system. Outstanding features are: large land area, restricted air space, long and flat artillery ranges, projectile recovery, sonic and electromagnetic sterility and diverse technical and scientific skills.

Dugway Proving Ground
Dugway, UT 84022-5000
(435) 831-3701

Commander: COL John A. Como
Technical Director: I. Gary Resnick

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	27.811	0.000	13.074	40.885
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	27.811	0.000	13.074	40.885
Procurement	0.000	NA	0.280	0.280
Operations & Maintenance	0.782	NA	2.893	3.675
Other	0.547	NA	1.799	2.346
TOTAL FUNDING	29.140	0.000	18.046	47.186

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	16	16
CIVILIAN	20	73	361	454
TOTAL	20	73	377	470

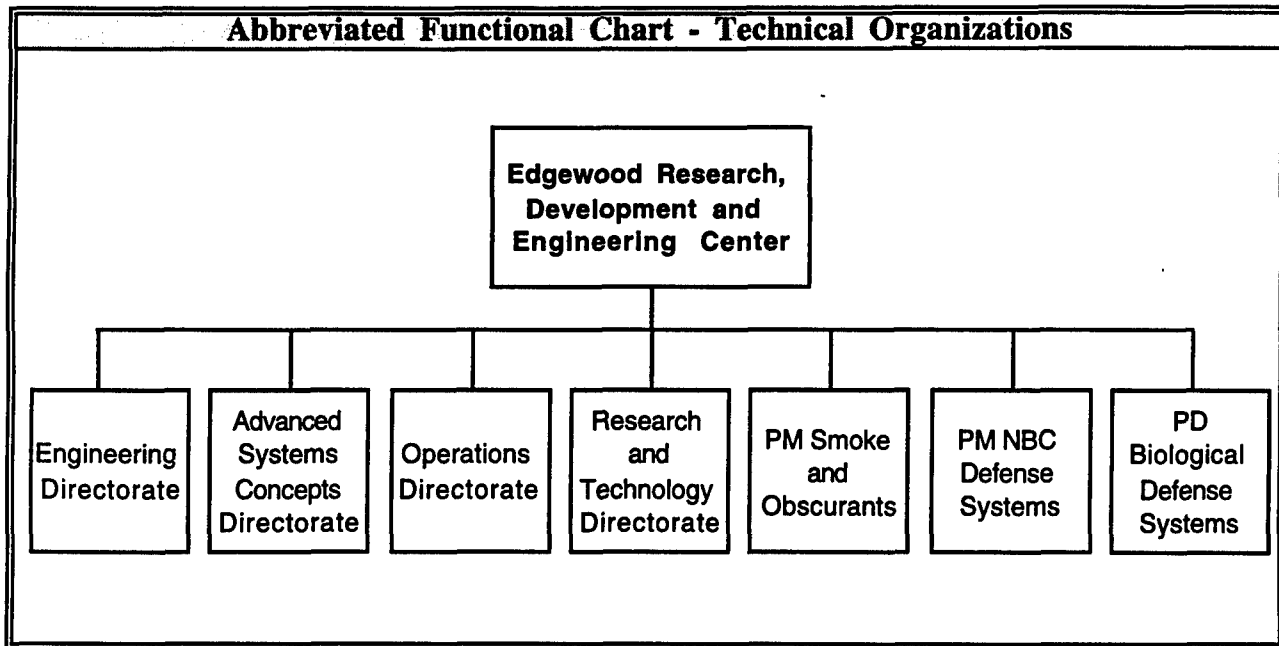
SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	64.000	REAL PROPERTY	183.000
ADMIN	182.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	2,254.000	EQUIPMENT	102.000
TOTAL	2,500.000	* NEW SCIENTIFIC & ENG. EQUIP.	3.000
ACRES	798,855	* Subset of previous category.	

NA = Not Applicable

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Edgewood Research, Development and Engineering Center

Abbreviated Functional Chart - Technical Organizations



Edgewood Research, Development and Engineering Center

Aberdeen Proving Ground, MD 21010-5423
(410) 671-3838

Acting Technical Director: Dr. James A. Baker

MISSION

A research, development and engineering center for executing the chemical and biological defense programs for the Army and the Joint Services (JS). Provide research, development and acquisition as well as life cycle engineering support for chemical/biological defense and smoke/obscurant equipment under DODD 5160.5. Act as DoD lead lab for the JS chemical/biological/smoke technology base. The Edgewood RDEC technical director is also the manager of the Edgewood NBC RDA Enterprise which includes PM NBC Defense Systems, PM Smoke/Obscurants, Program Director of Biological Defense Systems, and the Edgewood RDEC. Responsible for the Domestic Preparedness Program, preparing the United States for the possibility of a terrorist attack involving nuclear, biological or chemical weapons.

CURRENT IMPORTANT PROGRAMS

- Nuclear, Biological and Chemical (NBC) Reconnaissance, Detection and Identification.
- Individual and Collective Protection.
- NBC Decontamination.
- Smoke and Obscurants and Target Defeating Materials.
- Chemical Treaty Verification.
- Chemical and Biological Remediation.
- CB counterterrorism.
- Domestic Preparedness.

EQUIPMENT/FACILITIES

Major equipment is contained in a complex of R&D engineering/laboratory areas and includes: Process engineering facility; Production and facility design chamber for studies of respiratory protection design drivers; Simulant agent challenge test chamber; Rubber/elastomer mold facility; Specialized chemical agent labs; Pyrotechnic mixing, loading, handling facility; subsonic, supersonic, transonic wind tunnel; Complete analytical chemistry (trace analysis/tandem mass spectrometry); Obscurant test chambers for transmission measurements; Laser spectroscopy lab; Robotic toxic agent lab; CAD/CAE/CAM network; Super toxic facility; Design Evaluation Chemical Surety Lab; Decontamination/Detoxification Facility; Explosive test chamber; Toxic Dissemination Test Chamber; Inhalation Toxicology Laboratories; Molecular Modeling Facility; Microland Laboratory with electron microscopy and surface spectroscopy; Experimental Fabrication Facility; Nephelometry laboratory/Single Particle Laboratory; Smoke Breeze Tunnel; Controlled Environment; Soil-Core Microism Unit Chambers; Decontamination Test Facility; World Certified Treaty Laboratory.

Edgewood Research, Development and Engineering Center

Aberdeen Proving Ground, MD 21010-5423

Acting Technical Director: Dr. James A. Baker

(410) 671-3838

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	1.621	NA	NA	1.621
6.1 Other	1.788	0.042	2.100	3.930
6.2	15.676	0.355	17.404	33.435
6.3	4.968	0.171	8.407	13.546
Subtotal (S&T)	24.053	0.568	27.911	52.532
6.4	14.759	0.414	20.324	35.497
6.5	15.267	1.064	52.175	68.506
6.6	3.780	0.099	4.884	8.763
6.7	0.200	0.000	0.000	0.200
Non-DOD	8.167	0.009	0.484	8.660
TOTAL RDT&E	66.226	2.154	105.778	174.158
Procurement	19.468	NA	155.189	174.657
Operations & Maintenance	33.647	NA	38.877	72.524
Other	18.491	NA	1.163	19.654
TOTAL FUNDING	137.832	2.154	301.007	440.993

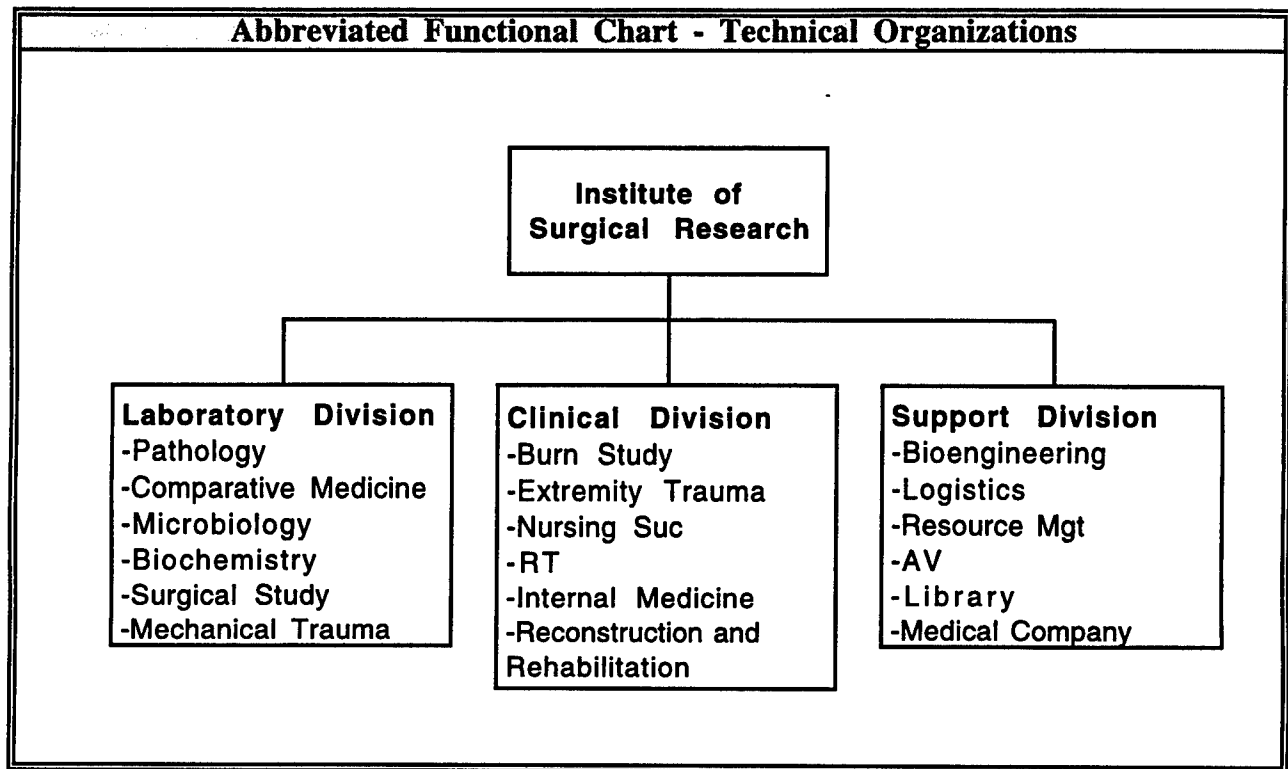
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	2	11	37	50
CIVILIAN	26	426	611	1,063
TOTAL	28	437	648	1,113

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	760.000	REAL PROPERTY	94.000
ADMIN	431.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	635.000	EQUIPMENT	142.061
TOTAL	1,826.000	* NEW SCIENTIFIC & ENG. EQUIP.	12.818
ACRES	0	* Subset of previous category.	

NA = Not Applicable

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Institute of Surgical Research

Institute of Surgical Research
Fort Sam Houston, TX 78234-6315
(210) 916-3219

Commander & Director: COL Cleon Goodwin
Deputy Cmdr: COL David Zolock

MISSION

Provide medical solutions and products for injured soldiers by integrating laboratory and clinical research.

CURRENT IMPORTANT PROGRAMS

The center of research at this Institute is the Clinical Operations Protocol, which supports the care of burned and extremity trauma patients. Thermal injury is the only human model with a severity - quantifiable disease (dose of injury : percent of total body surface area burned), allowing stratification into meaningful statistical designs. This unique setting provides a foundation for other clinical and laboratory research protocols that investigate the pathophysiology and treatment of trauma and its complications. The clinical protocol assures delivery of standardized care essential for controlled clinical trials and outcomes research. The Extremity Trauma program broadens this Institute's influence in the study of all types of trauma. Another important program is the training of flight teams to provide aeromedical transfer and care of injured soldiers. At the same time, in-house programs provide military surgeons, medical students, fellows, and medical staff from foreign countries intensive training and participation in the care of combat casualties and other severely injured patients. Taken together, this integration of physician-investigator and basic scientist promotes the foundation of basic science, as well as, applied science directly testable in trauma patients, and offers a highly focused, unique program for the military related to warfighting activities. No other such resource exists in the United States military.

EQUIPMENT/FACILITIES

The USAISR's equipment inventory of basic and clinical research equipment valued at over \$15,600,000. The Institute consists of a 40 bed inpatient research unit of 50,300 square feet on the 4th floor of Brooke Army Medical center and the laboratory located in an adjacent 84,000 square foot research facility dedicated in FY96. Capabilities include: integrated clinical and laboratory research facilities and injured soldier test platforms; mass casualty burn care; aeromedical transport teams for multiple trauma victims with burn injuries; instruction in resuscitation and long term burn care; a computerized database of over 40 years of data on injury specific research subjects; a nutrition and metabolic study program; comprehensive orthopedic surgery and extremity research staff and research program; ballistics research laboratory; state-of-the-art animal operating suites; an image analysis facility; biocontainment suite for studying the effects of hazardous materials; materials testing apparatus and tissue engineering capabilities; and the only research clinical evaluation/management facility for injured soldiers in the U.S. military.

Institute of Surgical Research
Fort Sam Houston, TX 78234-6315
(210) 916-3219

Commander & Director: COL Cleon Goodwin
Deputy Cmdr: COL David Zolock

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.092	NA	NA	0.092
6.1 Other	0.478	0.000	0.000	0.478
6.2	5.256	0.000	0.000	5.256
6.3	0.158	0.000	0.000	0.158
Subtotal (S&T)	5.984	0.000	0.000	5.984
6.4	0.000	0.000	0.000	0.000
6.5	0.005	0.000	0.000	0.005
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	5.989	0.000	0.000	5.989
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.001	NA	0.000	0.001
Other	0.000	NA	0.000	0.000
TOTAL FUNDING	5.990	0.000	0.000	5.990

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

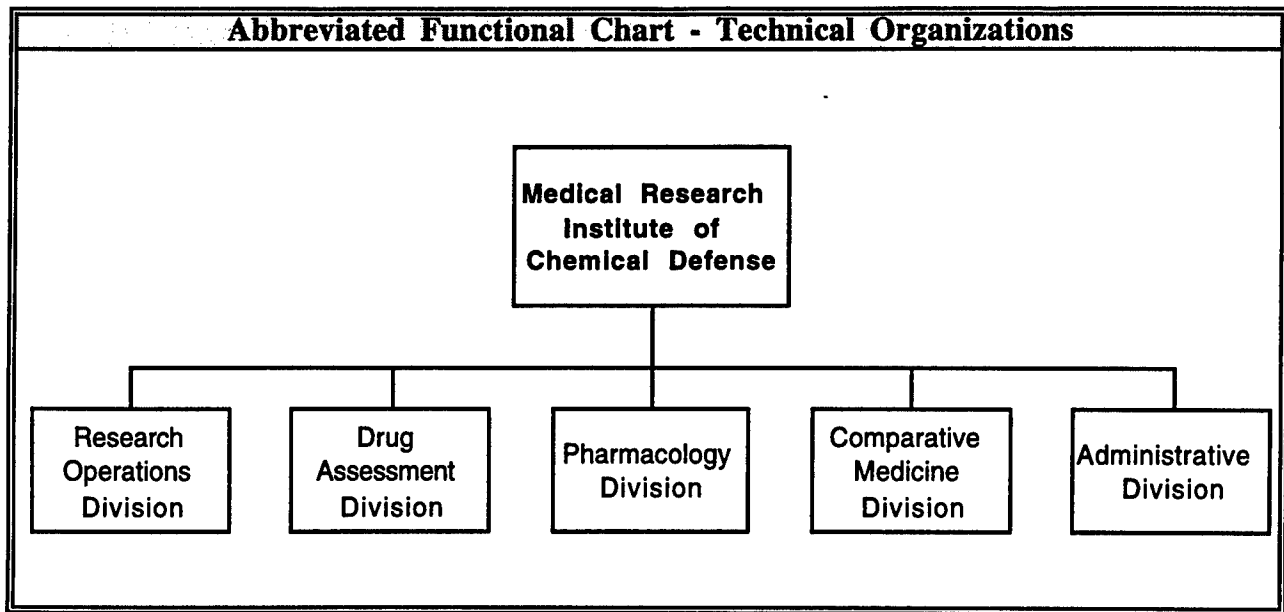
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	21	25	140	186
CIVILIAN	4	27	21	52
TOTAL	25	52	161	238

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	73.850	REAL PROPERTY	13.000
ADMIN	11.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	50.300	EQUIPMENT	15.600
TOTAL	135.150	* NEW SCIENTIFIC & ENG. EQUIP.	0.100
ACRES	1	* Subset of previous category.	

NA = Not Applicable

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Medical Research Institute of Chemical Defense



Medical Research Institute of Chemical Defense

Aberdeen Proving Gr, MD 21010-5425
(410) 671-3276

Commander: COL James S. Little
Deputy Cdr: COL James A. Romano Jr.

MISSION

The U.S. Army Medical Research Institute of Chemical Defense is the Department of Defense's lead laboratory for the development of medical countermeasures against chemical warfare (CW) agents and responsible for training personnel on the medical management of chemical casualties. This mission includes: fundamental and applied research on mechanisms of action of CW threat agents, candidate pretreatment, treatment, and personal or skin decontamination compounds in order to establish a scientific and technical base from which to plan and formulate enhanced medical countermeasures to CW threats and to develop improved prevention and treatment modalities for CW casualties; test and evaluation of drugs, decontaminants, and medical equipment in development for the prevention, resuscitation, treatment, and management of chemical casualties; assistance in the integration of the concepts and products from these research, development, test, and evaluation mission activities into the logistical, doctrine and organizational development, and training systems; and training of both medical and non-medical personnel in the prevention and management of chemical casualties. In addition, the Institute has the mission to conduct research on medical defense against low molecular weight toxins.

CURRENT IMPORTANT PROGRAMS

Research programs at the Institute emphasize preservation of combat effectiveness by timely provision of medical countermeasures to chemical warfare (CW) agents in response to DA and DOD requirements. These programs maintain the technologic capability to meet present requirements and to counter future CW and neurotoxin threats, provide individual level prevention and protection against these threats, and enhance the medical management of CW and neurotoxin casualties, enhancing survival and expediting and maximizing return to duty.

The Institute conducts basic research, exploratory development, non-system development, and, on a reimbursable basis, advanced development of medical countermeasures for CW and neurotoxin agents, investigates the biomedical effects of CW agents, neurotoxins, and candidate medical countermeasures to these threats, conducts safety and efficacy studies of candidate pretreatment and prophylactic countermeasures, develops analytical technologies for medical countermeasures, and performs advanced research into CW and neurotoxin casualty care technology. We have met the FY97 objective of demonstrating efficacy of candidate countermeasures against vesicant injury in an animal model, and are on target to meet the FY00 deadline to demonstrate safety and efficacy of a methemoglobin former for pretreatment against cyanide, and have made a milestone (MS) 1 transition of this product in FY95. The search for additional cyanide countermeasures is presently in technology watch. In addition to the development of mutant human butyrylcholinesterase as a biological scavenger, we are now developing mutant human carboxylesterase as another approach to meeting the FY99 MS 0 transition goals. We have also applied information gained in the bioscavenger program to the development of a cholinesterase containing sponge which is reusable, and would be capable of being used for nerve agent decontamination of patient wounds. Candidate advanced anticonvulsants are presently undergoing evaluation. We have demonstrated the efficacy and safety of a class of drugs as an advanced anticonvulsant to serve as an adjunct or component for the soldier/buddy-use nerve agent antidote. This accomplished an objective to achieve a MS 0 transition of this product by FY97. The advanced anticonvulsant is more effective in rapidly terminating on-going seizures, in preventing their reoccurrence, and in protecting against nerve agent-induced, seizure related brain damage, and also lacks any abuse potential; all these features

CURRENT IMPORTANT PROGRAMS (continued)

represent significant improvements over the current anticonvulsant product. Efforts to demonstrate by FY02 safety and efficacy sufficient for a MS 0 transition of the technology for a reactive topical skin protectant that will provide protection against penetration and will detoxify both vesicant and nerve CW agents are on track. This product will represent a significant increment in protection over the topical skin protection which is presently in advanced development. The Institute has developed a pathophysiology database on respiratory agents which are currently in a technology watch.

The Chemical Casualty Management effort identifies and utilized new technologies to improve decontamination and clinical diagnosis, prognosis, and management of chemical agent casualties. A noninvasive methemoglobin prototype monitor was received for evaluation and direct comparison with results from blood samples analyzed by a hemoximeter. This device will monitor therapy used to provide protection against or treatment for cyanide exposure. The cholinesterase Test System received approval by the FDA and a M 1/3 transition is being coordinated by MRMC. The use of CO2 laser debridement for sulfur mustard wounds of the skin produced accelerated healing through improved viability and organization of the epidermis.

During FY97, 37 courses on the Medical Management of Chemical Casualties were conducted where over 2190 students were trained. The Institute also provided training to members of the 520th Theater Army Medical Laboratory on how to work with chemical warfare agents and on instrumentation and methods to detect these agents. Finally, considerable effort was continued on determining the effectiveness of our current medical countermeasures against several novel threat agents.

The Institute maintained a total of 1 Cooperative Research and Development Agreements (CRDA) and 31 Material Transfer Agreements (MTA) during FY 97.

EQUIPMENT/FACILITIES

The Institute's facilities support chemical casualty care training, physiology, drug assessment, pathophysiology, pharmacology, analytical chemistry, neurotoxicology, veterinary surgery, chemical safety/surety, medical maintenance, information and resource management, supply and quality assurance. A technical library with 6,000 books, 1,000 journal titles, and access to many databases is an integral part of our Institute. Video facility, computer facility and 7,000 SF animal facility also supports our researchers. Radioisotope chemical antidote and biochemical analysis, histochemistry, behavioral testing, drug screening, pharmacokinetics, molecular modeling, liquid, gas, column and affinity chromatography, quantitative image enhancement/analysis, electrophoresis, spectroscopy, fluorometry and spectropolarimetry, GC mass spectrometry, electron spin resonance and peptide synthesis/sequencing, amino acid analysis, monoclonal haptenantibodies; electron, scanning and X-ray microscopy, cell cloning, and receptor analysis are also supported.

Major Facilities and Equipment:

Building E-3100: Main Medical Chemical Defense Research Laboratory and Administrative Building.

Building E-3081: Unique to DOD. Contains a Chemical Surety Materiel Laboratory for Medical Chemical Defense Research.

Building E-3156: Large Animal Holding/Chemical Research Facility.

Building E-3244: Biotxin Research Facility.

Building E-3103/E-3106: Chemical Casualty Care Training Facility.

EQUIPMENT/FACILITIES (continued)

Building E-3103/Classroom: Chemical portion of the Management of Chemical and Biological Casualties Course (6H-F26) is conducted here.

Building E-3101: Administrative Facility: Surety, Safety, Environment, and Contract Management.

Hazardous Materiel Storage and 90-Day Hazardous Waste Sites: These sites meet stringent specifications which conform to the environmental requirements for the storage and disposition of chemicals and hazardous materials.

Building E-3105: Information Management Support Facility.

Building E-3107: Equipment Turn-in Facility.

Building E-3104: Environmentally Controlled Building for Electronic Equipment.

Building E-2180: Equipment Storage and Turn-in Facility.

Building E-3083: Equipment storage for Medical Chemical and Biological Casualties course.

Building E-5826: Animal Care Equipment Storage Facility.

Building E-3221: Hazardous Waste Storage Facility.

Direct Digital Control HVAC System: System provides constant control and 24-hour remote monitoring of chemical fume hoods in the Surety Area of building E-3081, controls HVAC throughout remainder of laboratories and administrative areas, and controls and remotely monitors all animal rooms in buildings E-3081, E-3100, E-3156, and E-3244.

Walk-in Coolers in Building E-3081, E-3100: Storage of chemicals used for research.

Chillers, Building E-3081: Installed in 1994 to meet EPA requirements. Each unit produces 350 tons of cooling using 123 refrigerant.

Chillers, Building E-3100: Installed in 1994 to meet EPA requirements. Each unit produces 350 tons of cooling using 123 refrigerant.

Medical Waste Incinerator: Required to burn animal bedding, carcasses, and medical waste generated by the Institute

Air Compressor: Required to supply laboratories with bench air for research.

Chemical/Biological/Radiological (CBR) Filter Trains: Provided for all 77 chemical/biological hoods located in buildings E-3100, E-3081, and E-3244. Each CBR filter train consists of a housing unit containing prefilter, as well as the appropriate number and size of High Efficiency Particulate (HEPA) and High-Efficiency Gas-Phase Absorber (HEGA) filters. All filter trains are in support of the Chemical/Biological Defense Program and are in compliance with Environmental Protection Agency, State, and Federal Standards. Exterior Walk-in (adjacent Bldg E-3100): Storage of animal carcasses prior to incineration.

Auxiliary Chillers (E-3100): Provides renovated laboratories with additional cooling to support electronic equipment.

Decontamination Showers Required to conduct research in accordance with regulations.

EQUIPMENT/FACILITIES (continued)

Building E-3156/Associated Animal Pens and rooms: Quarantine area for newly arrived large animal species. Required for the care of animals used in research.

House Water Distillation System (Bldgs E-3100, E3081, E-3244): This central system feeds water to satellite polishing systems in the individual laboratories. Pure laboratory water is needed in virtually all segments of laboratory research. High-purity water is used for reagent buffers and sensitive instrumental analyses (such as High Pressure Liquid Chromatograph, Gas Chromatograph/Mass Spectrometer, as well as inwashing and/or preparing biological solutions such as media for tissue culture.

Hazardous Materiel and 90-Day Hazardous Waste Sites: These sites meet stringent specifications which conform to the environmental requirements for the storage and disposition of chemicals and hazardous materials.

Emergency Generator (Bldg E-3100): Provides emergency power for lighting, freezers, incubators, and other specialized equipment which must remain operational.

Administrative and Laboratory Emergency Generator (Bldg E-3081): Provides emergency power for lighting, freezers, incubators, and other equipment which must remain operational.

Surety Area Back-up Generator (Bldg E-3081): Supplies emergency power to the entire chemical surety wing to include all fume hoods, heating, ventilation and air conditioning systems, and electrical systems.

Uninterruptable Power System (UPS) (Bldg E-3081): System supplies immediate power to the fume hood exhaust blowers in the chemical surety area until the emergency generator starts and transfers power.

Surety Area Holding Tanks (Bldg E-3081): Consists of two 10,000 gallon tanks which hold all waste water generated in the surety wing. This ensures that chemical spills will not escape into the sanitary sewer.

Medical Research Institute of Chemical Defense
Aberdeen Proving Gr, MD 21010-5425
(410) 671-3276

Commander: COL James S. Little
Deputy Cdr: COL James A. Romano Jr.

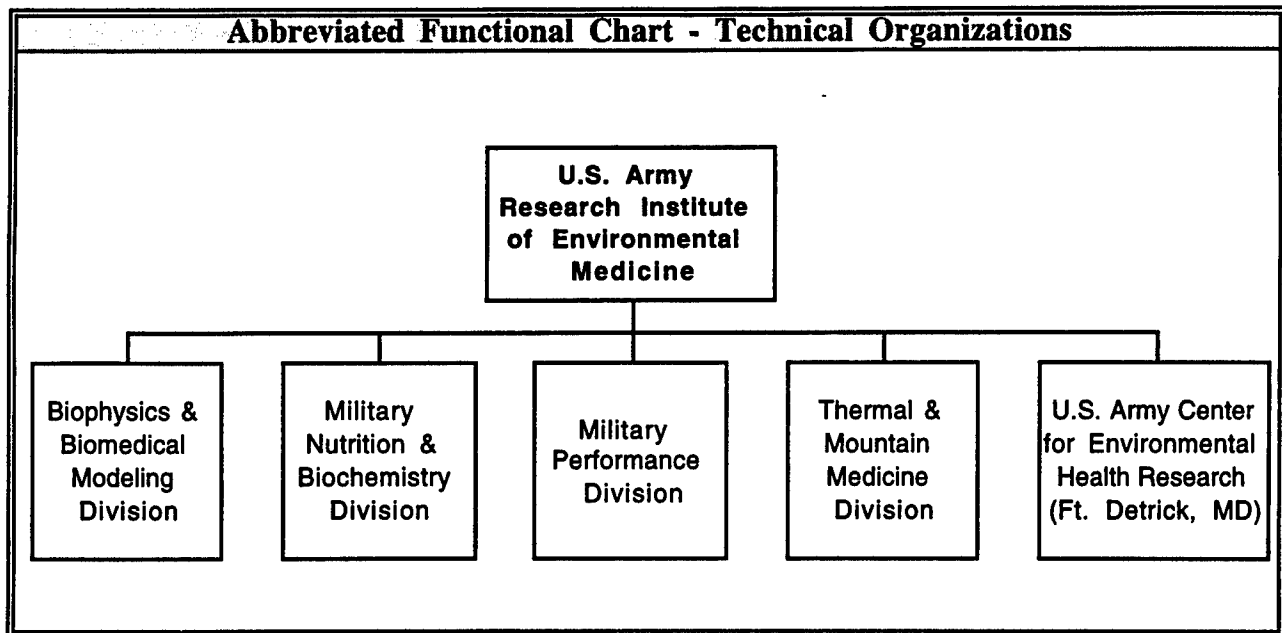
FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.051	NA	NA	0.051
6.1 Other	3.521	0.000	2.171	5.692
6.2	10.951	0.000	0.458	11.409
6.3	1.992	0.000	8.419	10.411
Subtotal (S&T)	16.515	0.000	11.048	27.563
6.4	0.130	0.000	0.000	0.130
6.5	0.047	0.000	0.000	0.047
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	16.692	0.000	11.048	27.740
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	1.508	NA	0.000	1.508
Other	1.000	NA	0.000	1.000
TOTAL FUNDING	19.200	0.000	11.048	30.248

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	20	12	21	53
CIVILIAN	29	32	89	150
TOTAL	49	44	110	203

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	37.419	REAL PROPERTY	23.400
ADMIN	38.433	* NEW CAPITAL EQUIPMENT	0.113
OTHER	125.024	EQUIPMENT	0.032
TOTAL	200.876	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	30	* Subset of previous category.	

NA = Not Applicable

Medical Research Institute of Environmental Medicine

Medical Research Institute of Environmental Medicine

Natick, MA 01760-5007
(508) 233-4811

Commander: COL David M. Penetar
Deputy Cdr: LTC John P. Obusek

MISSION

Conduct basic and applied research to determine how exposure to extreme heat, severe cold, high terrestrial altitude, occupational tasks, physical training, deployment operations and nutritional factors affect the health and performance of military personnel. Conduct research, development, testing, and validation of new methods and products for measuring chemical contaminants and their impact on the health and performance of US forces in garrison and during deployment.

CURRENT IMPORTANT PROGRAMS

Environmental Injury: Demonstrate the efficacy of strategies to predict, prevent and treat environmental illnesses, injuries and performance decrements.

Performance Limits: Develop and validate models to predict the effects of heat, cold, high altitude, hydration, nutrition status and clothing and equipment on performance.

Nutritional Strategies: Identify and demonstrate nutritional strategies to maintain health and enhance soldier performance, to include maintaining immunocompetence.

Musculoskeletal injuries and physical performance: Demonstrate the efficacy of methods to reduce the incidents of musculoskeletal injuries and optimize performance during military training and operations. Special emphasis is being placed on Defense Women's Health Research.

Warfighter Physiological Status Monitor: Develop ambulatory monitoring instruments to assess the physiological status of the individual soldiers.

Medical Chemical Defense: Investigate/define mechanism(s) of vesicant injury.

Deployment Toxicology: Develop new assays, methods and products for measuring chemical contaminants and their impact on the health and performance of U.S. forces in garrison and during deployment.

USARIEM's Technology Transfer Program included five new and fully negotiated Cooperative Research & Development Agreements during FY 97, bringing the total number of agreements to 17. The new agreements are:

- Aircast, Inc. - "The Parachute Ankle Brace (PAB) and the Reduction of Ankle Injuries Associated with Airborne Operations and Other Military Activities"
- ESA, Inc. - "A Disposable, Integrated Sampling and Sensing Device and Hand-Held Reader for Blood Lead Analysis, Utilizing Traditional Exchange Chemistries and Anodic Stripping Voltammetric Methods of Analysis"
- The Ohio State University - "Correlation of Reproduction Endocrine Effects on Body Temperature and Neuronal Activity"
- Boston University - "Factors Affecting Muscle Fatigue and Exercise Performance"
- Brown University - "The Use of Voice Onset Timing to Assess the Incidence and Severity of Acute Mountain Sickness"

The USARIEM Technology Transfer Program involved the participation of 20 scientists and engineers.

EQUIPMENT/FACILITIES

Unique facilities include: altitude chambers, animal care facility accredited by AAALAC (American Association for Accreditation of Laboratory Animal Care), biophysical evaluation chambers, biomechanics laboratory, electron microscopy laboratory, environmental chambers, human/animal physiology laboratories, physical performance laboratory, Pikes Peak research facility, psychology laboratory, water immersion laboratory, access and primary user of the Doriot Climatic Chambers (a co-located facility assigned to Soldier Systems Command). Facilities located at the U.S. Army Center for Environmental Health Research (Fort Detrick, MD) include: aquaculture and aquatic toxicology laboratories, immunotoxicology laboratory, and mobile analytical chemistry laboratories and lab facilities at Colorado State University.

Medical Research Institute of Environmental Medicine

Natick, MA 01760-5007

(508) 233-4811

Commander: COL David M. Penetar

Deputy Cdr: LTC John P. Obusek

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.050	NA	NA	0.050
6.1 Other	2.207	0.044	0.842	3.093
6.2	5.446	0.043	0.845	6.334
6.3	0.121	0.000	0.000	0.121
Subtotal (S&T)	7.824	0.087	1.687	9.598
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.005	0.095	0.100
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	7.824	0.092	1.782	9.698
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.000	NA	0.000	0.000
Other	1.151	NA	0.654	1.805
TOTAL FUNDING	8.975	0.092	2.436	11.503

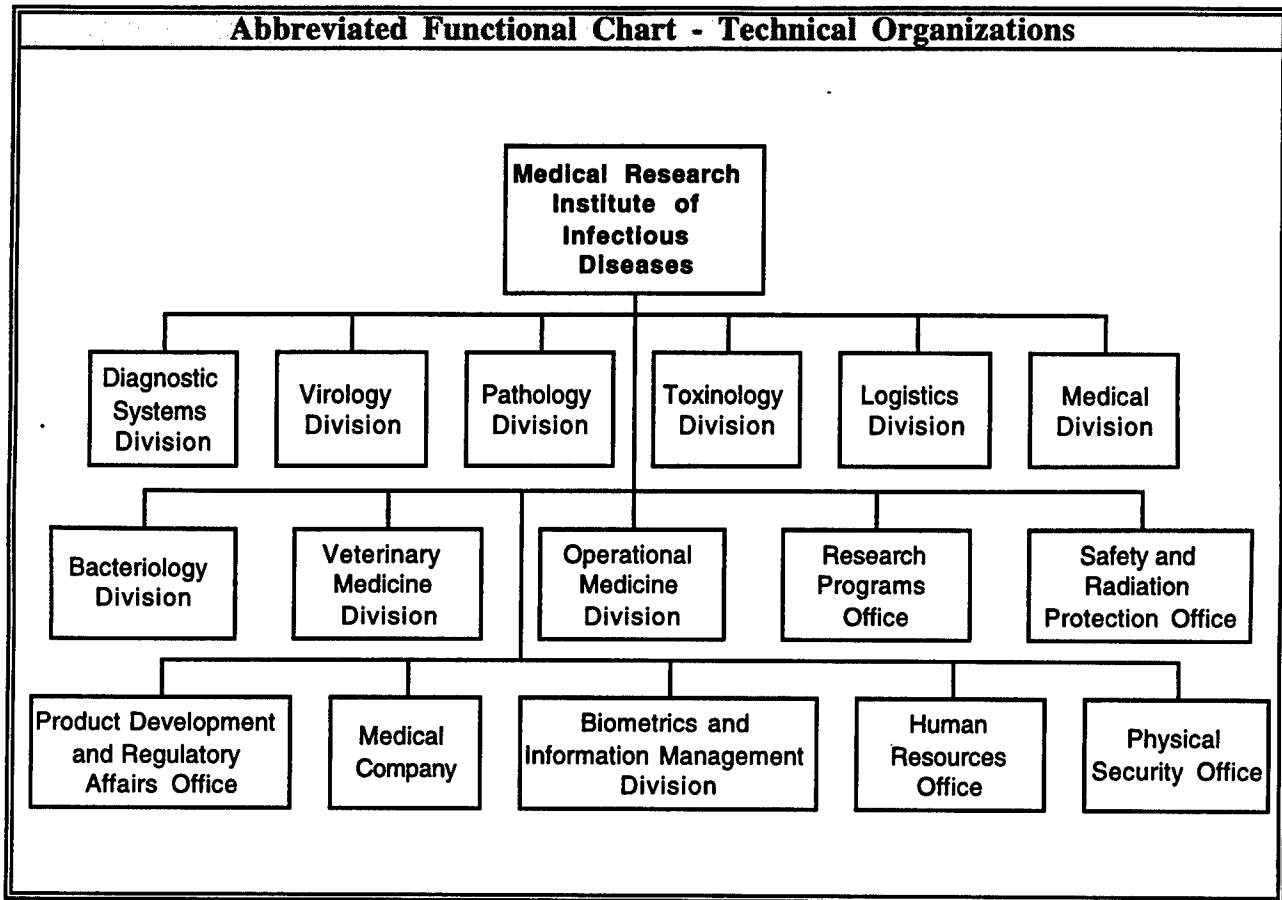
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	20	1	45	66
CIVILIAN	24	31	29	84
TOTAL	44	32	74	150

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	93.676	REAL PROPERTY	25.505
ADMIN	10.869	* NEW CAPITAL EQUIPMENT	0.000
OTHER	9.423	EQUIPMENT	31.687
TOTAL	113.968	* NEW SCIENTIFIC & ENG. EQUIP.	0.210
ACRES	1	* Subset of previous category.	

NA = Not Applicable

Medical Research Institute of Infectious Diseases



Medical Research Institute of Infectious Diseases

Fort Detrick, MD 21702-5011

(301) 619-2833

Commander: COL David R. Franz

Dep. Commander: LTC Gerald B. Jennings

MISSION

USAMRIID's mission is to conduct research to develop strategies, products, information and training for medical defense against biological warfare threats and against naturally occurring infectious agents of military importance that require special containment. Medical countermeasures developed to protect military personnel against biological attack include vaccines, therapeutic drugs, diagnostic capabilities, and various medical management procedures. These products are intended to eliminate or minimize the effects of disease and preserve fighting strength. The Institute is the lead research laboratory in the Medical Biological Defense Research Program and participates in crucial aspects of the Infectious Disease Research Program. The Institute serves a key role in national defense and in infectious disease research as the only biological containment laboratory in the Department of Defense for the study of hazardous diseases. In addition, USAMRIID provides critical and timely training in medical management of biological casualties to military health care providers. As a world-renowned resource, USAMRIID serves not only as the DoD reference laboratory for identification of biological agents and diagnosis of diseases caused by them, but as a reference center for the U.S. Centers for Disease Control and Prevention and the World Health Organization.

CURRENT IMPORTANT PROGRAMS

Development of medical countermeasures for biological warfare threats continues to be the highest mission priority. New vaccine candidates based on naked DNA or constructed using a benign virus vector have been generated using genetic engineering approaches and are in various stages of advanced preclinical testing. Production of pilot lots of candidate vaccines for Venezuelan equine encephalitis and for botulinum toxins A and B was initiated using facilities and procedures that follow current Good Manufacturing Practices as specified by the Food and Drug Administration. An intensive research program in antiviral drug therapy for orthopox viruses has yielded promising results; one drug in particular was identified as a top candidate for possible human efficacy trials in treatment of monkeypox infections. Another drug has been identified as potentially efficacious for treatment of infections with filoviruses such as Ebola and Marburg. Continued interactions with the pharmaceutical industry through Cooperative Research and Development Agreements allow researchers access to drugs that are in clinical development for commercial purposes so that they can be tested against the agents of military interest at USAMRIID.

In cooperation with other DoD and federal laboratories, as well as with industry, USAMRIID demonstrated the feasibility of rapid diagnostic identification of biological agents in a briefcase-sized system using microminiaturized technology for polymerase chain reaction analysis of nucleic acids. Changes of only one nucleic acid could be detected in under 30 minutes. The reference laboratory capabilities for identification of biological threat agents was expanded to include additional technologies and diagnostic materials.

CURRENT IMPORTANT PROGRAMS (continued)

Preliminary data from the clinical study to assess the possibility of reducing the dosage schedule for anthrax vaccine appear very promising. Final analysis of the data must await the completion of the study in FY 98. The interactive distance learning program designed to increase our capability to train military health-care providers in the Medical Management of Biological Casualties was broadcast in September 1997 to hundreds of sites, reaching thousands of enrolled students. The program was an enormous success and proved to be a highly cost-effective mechanism for providing this training. A video version of the training is now available and a compact disc version will be available in 1998. USAMRIID also is recognized as an important national resource for support in countering biological terrorism. The formal response team established to assist other responsible agencies in this arena participated in numerous exercises, presentations, and training sessions, providing technical expertise and laboratory capabilities to address this problem.

EQUIPMENT/FACILITIES

Three buildings provide 347,000 square feet with approximately 15% of the laboratory space capable of operations at biosafety level 3 and approximately 3% capable of operations at biosafety level 4 (maximum containment). These containment laboratories are a unique international resource for the safe study of high hazard disease agents, and are the only such laboratories within the DOD. A complete renovation of the containment and maximum containment areas of Building 1412 was completed recently.

Other unique facilities include: a 16-bed clinical research ward; high containment patient care facility and support functions; containment patient care facility and support functions; contained dynamic aerosol laboratory exposure systems; cell culture and hybridoma laboratory; and electron microscopy equipment. The laboratory facilities also include a farm for the care and housing of large animals used in research.

Medical Research Institute of Infectious Diseases

Fort Detrick, MD 21702-5011

(301) 619-2833

Commander: COL David R. Franz

Dep. Commander: LTC Gerald B. Jennings

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	1.179	NA	NA	1.179
6.1 Other	8.983	0.100	0.000	9.083
6.2	8.894	0.010	0.000	8.904
6.3	4.269	0.050	0.000	4.319
Subtotal (S&T)	23.325	0.160	0.000	23.485
6.4	0.128	0.000	0.000	0.128
6.5	0.073	0.000	0.000	0.073
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	23.526	0.160	0.000	23.686
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	2.151	NA	0.000	2.151
Other	1.211	NA	0.000	1.211
TOTAL FUNDING	26.888	0.160	0.000	27.048

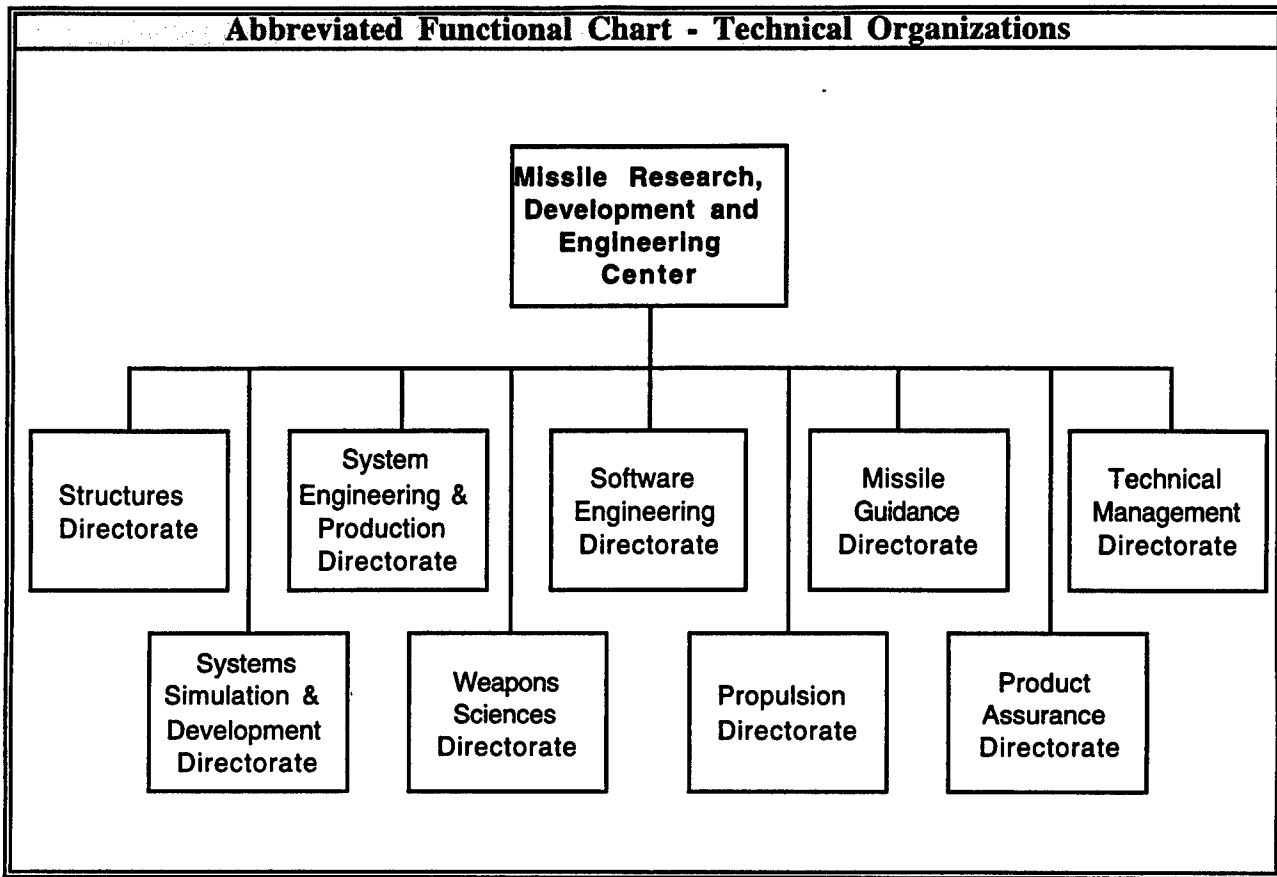
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	38	10	184	232
CIVILIAN	42	48	105	195
TOTAL	80	58	289	427

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	121.000	REAL PROPERTY	24.892
ADMIN	78.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	148.000	EQUIPMENT	42.825
TOTAL	347.000	* NEW SCIENTIFIC & ENG. EQUIP.	1.698
ACRES	150	* Subset of previous category.	

NA = Not Applicable

Missile Research, Development & Engineering Center



Missile Research, Development & Engineering Center

Redstone Arsenal, AL 35898-5241
(205) 955-6805

Tech. Director: Dr. William C. McCorkle
Assoc. Director: Dr. Larry O. Daniel

MISSION

To plan, manage and conduct research, exploratory and advanced development for guided missile and rocket weapon systems and related components; to provide scientific, engineering, and technical support for weapon system programs over the complete life cycle; and to manage computer resources embedded in battlefield automated systems. MRDEC provides the technical expertise to enable the services to be smart buyers and users of missiles, rockets, unmanned vehicles and their unique command and control systems, directed energy, non-lethal technology, computer resources embedded in battlefield automated systems, and related models and simulation and, as such, is an essential part of the acquisition process.

MRDEC's science and technology base mission includes planning, managing, and conducting research, advanced development, and exploratory investigation in response to Army system needs. MRDEC's national defense mission includes mutually beneficial relationships with the private sector for those areas where parallel paths should be and can be reduced by cooperation. MRDEC's life cycle systems engineering mission includes planning, establishing, and managing the Missile Command programs to develop new weapon systems, evaluate system and subsystem performance, and maintain high readiness status, assure effectiveness of fielded systems, and control both acquisition and O&S costs. Selective research and component development is conducted to generate new manufacturable technology, reduce development lead time and system cost, and improve reliability.

MRDEC is the Army's lead organization for technologies in missile propulsion, guidance and control/terminal homing, high energy lasers, missile systems simulation, and unmanned vehicles. MRDEC is the System Integrator for the Joint Program Office for Unmanned Aerial Vehicles. MRDEC has the DoD Lead in the Rapid Force Projection Initiative (RFPI), a major Advanced Concept and Technology Demonstration (ACTD) that includes AMC-wide simulation/demonstration/residual support. In addition, MRDEC is the lead Center within the U.S. Army Materiel Command for the Early Entry, Lethality, and Survivability Battle Lab at Fort Monroe, Virginia.

VISION: Weapon System Technology for Swift Decisive Victory without Casualties.

STRATEGIC GOALS:

1. Demonstrate feasibility of new systems concepts that significantly enhance warfighting capabilities by integration of enabling technology into demonstration efforts.
2. Focus the science and technology base on the new realities.
3. Increase market share: broaden the marketplace.
4. Improve the responsiveness, affordability, and quality of MRDEC products and engineering services.

ENABLING STRATEGIES:

1. Keep workforce fully engaged in state-of-the-art technology work to preserve capability as smart buyer.
2. Develop a superior workforce and a quality environment.

CURRENT IMPORTANT PROGRAMS

Ducted Rocket Engine (DRE) - This effort is a joint research and development program with Japan to develop and demonstrate a ducted rocket engine for medium surface-to-air missile to significantly increase the intercept envelope against aircraft, cruise missiles, and tactical ballistic missiles when compared to surface-to-air missiles using current solid rocket propulsion technology.

Multimode Airframe Technology (MAT) (formerly known as Long Range Fiber Optic Guided Missile (LONGFOG)) - This program will provide a 40 km day/night, multiple and high value time sensitive point target strike capability while inflicting minimum collateral damage. The LONGFOG system will provide the capability to select priority targets after launch, conduct limited man-in-the-loop BDA, and provide target area reconnaissance in addition to target attack by means of variable cruise velocity over areas of interest.

Future Missile Technology Integration (FMTI) (formerly known as The Army Combined Arms Weapon Systems (TACAWS)) - This project provides for the demonstration of advanced tactical missile technologies including seekers, propulsion, airframes, warheads, and guidance and control. The project will demonstrate lightweight multi-role missile technology in support of ground-to-ground, ground-to-air, air-to-air, and air-to-ground missions. Combined, flexible capability allows one system or variants of one system to replace many, realizing potential extensive savings in development costs, logistics, training, etc. The FMTI demonstration program is transitioning technology to the TOW Follow-on Engineering and Manufacturing Development (EMD), (Follow-on-to-TOW (FOTT)) program which begins in FY98, the EFOG-M ATD program in FY97/98, and the Joint Advanced Weapons System (JAWS), an Army/Marine Corps multi-purpose, multi-platform missile.

Guided MLRS ATD - This program will demonstrate a low cost guidance and a control package for the MLRS rocket. At extended ranges, large quantities of baseline rockets are required to defeat the target. With the addition of a guidance system, an improved delivered accuracy will be achieved. The number of rockets required to defeat the target will be reduced to one-sixth the current quantity at maximum ranges.

Rapid Force Projection Demonstration - The integrated system of systems concept of the ACTD provides lightweight, responsive precision fires to destroy threat armor forces during day, night, and adverse weather. This ACTD will evaluate the value added by the insertion of these new technologies into the force structure of an existing light unit in a lift constrained environment. The inserted systems will consist of forward sensors (hunters), advanced C2, and a suite of standoff killers.

Compact Kinetic Energy Missile (CKEM) Technology - This project demonstrates the compact kinetic energy missile technology necessary for a LOSAT P3I. The LOSAT P3I will match the lethality of the LOSAT while reducing the LOSAT take off weight by 40-50%, missile diameter by 20%, minimum range to peak velocity by 40-50%, and provide the maneuver capability required to destroy attacking fixed and rotary wing aircraft. Compatible with the LOSAT target acquisition and tracking system and could be compatible with the fire control system for close combat and short range air defense missions.

CURRENT IMPORTANT PROGRAMS (continued)

Low Cost Precision Kill (LCPK) 2.75" Guided Rocket - This project provides for demonstration of a low cost, accurate (1-m CEP) guidance and control retrofit package for the 2.75" Hydra-70 rocket that provides a stand-off range for a high single shot probability of hit ($Ph > \text{or} = 0.7$) against the long range target, exceeding the current unguided 2.75" rocket baseline by 1 or 2 orders of magnitude and thereby providing a 4 to 1 increase in stowed kills at 1/3 the cost per kill compared to current guided missiles. The increased accuracy will minimize collateral damage, reduce risk of fratricide, and will reduce mission times and sorties resulting in increased system survivability. Two separate retrofit guidance package approaches, one based on a solid state (strapdown) mechanization of semi-active laser (SAL) guidance, and the other, based on a potentially much lower cost innovative laser beam follower mode of guidance denoted Scatterider, will be developed and tested in parallel, with user participation, to assure the most cost effective solution is obtained in the neckdown to one system for the transition to EMD.

Counter Active Protection Systems (CAPS) - This project develops and demonstrates technologies which can be applied to Anti Tank Guided Weapons (ATGW) for improving their effectiveness against threat armor equipped with Active Protection Systems (APS). Current technology development is concentrated in the following areas: Radio Frequency (RF) Counter-measure (RFCM) technology for jamming or deceiving APS sensors used for detection, acquisition, and tracking; warhead integration and ballistic hardening of ATGW to reduce vulnerability to fragment impact.

Cooperative Research and Development Agreements (CRDAs):

COMPANY: Sy Technologies, Inc.

DURATION: 5/94 through 1/99

SUBJECT: Development and analysis of designs, and fabrication and test of these designs of binary optic elements for use in unique state-of-the-art optical systems.

PAYOFF: Reduction in costs, increase in reliability and performance of optical elements used in Army missile and optics systems.

COMPANY: Rockwell International Corp

DURATION: 7/94 through 1/97

SUBJECT: Development and verification of advanced analytical design methodology and design tool that optimizes the structural performance of components made of composite materials by tying material properties directly to the manufacturing process.

PAYOFF: Acceleration of the use of lightweight, high strength structures in the development of advanced Army missile systems and aircraft.

COMPANY: Signature Products

DURATION: 7/94 through 1/97

SUBJECT: Increasing the production rate and improving the C(60) reactor process for Radar Absorbing Materials (RAM).

PAYOFF: Increasing efficiency (higher impulse) in missile propulsion systems.

COMPANY: Optical Processing Technology Systems

DURATION: 4/95 through 9/97

SUBJECT: Development of components and algorithms required for demonstration of a diverse pattern recognition system using optical processors.

PAYOFF: High throughput, smaller size, decreases power consumption, and lower costing processors.

CURRENT IMPORTANT PROGRAMS (continued)

COMPANY: Hughes Missile Systems

DURATION: 5/95 through 12/96

SUBJECT: Development of a comprehensive Tolerance Optimization and Variability Reduction (TOVAR) process and methodology model which can be integrated into both product development and production processes.

PAYOFF: Increased production yields, lower production costs, and increased product reliability and robustness.

COMPANY: Optical Corp of America

DURATION: 5/96 through 9/97

SUBJECT: Optical Processing Architectures and Algorithms for Automatic Target Recognition - This research, development, and demonstration of revolutionary optical processing architectures and algorithms for automatic target recognition for military and commercial applications.

PAYOFF: Reduction in the production cost of military systems.

COMPANY: Rochester Photonics Inc.

DURATION: 9/96 through 5/99

SUBJECT: E-Beam Fabrication Technology - This research will evaluate the technique of direct E-Beam fabrication for diffractive optical components and performance of replication studies.

PAYOFF: Lower cost of optical components.

COMPANY: Georgia Tech Research Corporation

DURATION: 11/92 through 1/99

SUBJECT: Development of advanced manufacturing processes and equipment in the areas of microelectronics and photonics.

PAYOFF: Reduction in the production costs of military systems.

COMPANY: Optelecom

DURATION: 8/97 through 9/99

SUBJECT: Navigation Grade Interferometric Fiber Optic Gyroscope (IFOG) coils. This project is to qualify new coil winding patterns and mounting designs to achieve navigation grade performance IFOGs of substantially reduced volume. This research will have direct commercial applications such as aircraft navigation; ships, mining, and surveyors.

PAYOFF: Low cost miniaturized gyroscopes for navigational operations.

COMPANY: Hughes Missile Systems

DURATION: 7/97 through 6/99

SUBJECT: Computer Aided Modeling Design and Analysis (CAMDA) - This research will be used as a tool to investigate advanced missile concepts and have direct commercial applications in computer modeling and simulation.

PAYOFF: Enhanced computer-aided modeling with commercial and military applications.

COMPANY: Northrop Grumman Corp

DURATION: 6/97 through 1/99

SUBJECT: Adaptive Rocket Payload Configuration (ARPC) - This research will have direct commercial applications in the area of foreign military sales for multiple payload configurations and missile technology using large nose cone missiles launched from existing small launch tubes.

PAYOFF: Reduction in the production cost of military systems.

COMPANY: Honeywell, Lucent Technologies & Northrop Grumman

DURATION: 12/96 through 12/00

SUBJECT: Plastic Encapsulated Microcircuits in Severe Storage Environments -This effort involves cooperative research and development to determine the risk in using plastic encapsulated microcircuits in severe storage environments.

PAYOFF: Low cost hardened electrical circuits.

CURRENT IMPORTANT PROGRAMS (continued)

COMPANY: Nichols Research Corp

DURATION: 12/96 through 10/01

SUBJECT: Adaptive Radio Interface Device - The radio infrastructure developed under this effort will be designed with the intent of supporting multiple communications protocols, multiple physical radio implementations, and multiple form factors.

PAYOFF: Multiple protocols for military communications.

TECHNOLOGY TRANSFER HIGHLIGHTS:

Six new Cooperative Research and Development Agreements (CRDAs) were approved during FY97, and one existing CRDA was amended and extended through FY99. CRDAs were signed with the following companies: Optelecom, Hughes Missile Systems, Northrop Grumman, Nichols Research Company, and Honeywell, Lucent Technology and Northrop Grumman; with technologies ranging from Gyroscopes, computer-aided modeling design and analysis, radio interfaces, payload configuration and encapsulated microcircuits.

Sixteen (16) Domestic Technology Transfer Awards were presented by the MRDEC Director. These awards were given to each outstanding contributor for their effort to bring MRDEC technologies to the commercial market place.

EQUIPMENT/FACILITIES

Propellant Aging and Mechanical Properties Facility - This is the most modern facility in the world dedicated to solid rocket motor structural integrity and service life extension investigation. Completed in 1988, it meets DoD's latest safety requirements for handling hazardous propulsion materials.

Gel Propellant Rheology Facility - This facility is used to determine rheological properties of gelled propellants over the full range of the Army operational temperature limits and for shear rates equivalent to those imposed on the gels by engine injectors. This information is required to minimize the volume and weight of gel propulsion systems.

Ducted Rocket Test Facility - This is the most modern, economical, sub-scale direct connect air facility in the world and is used for testing ducted rockets and ramjets. Completed in 1995, it utilizes state of the art computer control to deliver a wide range of air flow rates and temperatures during a single test run, in effect 'flying' a mission while on the test stand.

Signature Characterization Facility (SCF) - This facility is used to characterize the exhaust plumes of rocket motors. The facility consists of a static test stand mounted inside an environmental chamber. Small test motors can be fired under any atmospheric condition of temperature and humidity, and evaluated as to their exhaust characteristics. These include visible and infrared flash, visible and infrared smoke attenuation, toxicity, particle analysis, and mm wave radar absorption.

Target and Seeker Measurement Facility (TSMF) - Used by the Army and Air Force for sensor/seeker design measurements, this facility includes a 300 foot tower and elevator combination allowing an operator access to equipment at any elevation up to the maximum. It also includes a 70 ton capacity target turntable with multiple degrees of freedom.

EQUIPMENT/FACILITIES (continued)

Advanced Simulation Facility - This center is unequalled in the free world providing hardware-in-the-loop-simulation capability. Consisting of 10 hardware-in-the-loop simulation facilities, the Center provides unique capabilities for closed guidance loop system performance evaluation in a laboratory environment of missiles and submunitions guided and/or fuzed by: microwave and millimeterwave radar; scanning and staring infrared sensors; other electro-optical signals; and by inertially sensed motion. Its international reputation is demonstrated by previous and on-going international programs and consultations with the representatives of Australia, Belgium, France, Germany, Israel, Korea, and the United Kingdom.

The AMCOM Distributed Simulation (DS) Center - This facility provides ten interconnected application rooms for the development and operation of virtual prototype simulators, multiple local area networks, and supporting hardware and software essential to the conduct of DS exercises. It houses the node, or gateway, to the Defense Simulation Internet and an extensive WAN which includes HWIL simulations, weapons system hardware, and virtual prototypes of systems.

The Advanced Prototyping, Engineering and Experimentation (APEX) Laboratory - This facility is a DS compliant laboratory network of the areas of weapon system developers in the areas of weapon system design and effectiveness studies. It provides the infrastructure necessary to link live, virtual and constructive elements in common synthetic environments.

Guidance and Control Analysis Facility - An all digital facility for check out of flight systems, this capability is unprecedented in its system bandwidth. It is currently used for real time check out of extremely high bandwidth ADKEM guidance and control components.

Anechoic RF Test Chamber - This facility is world renowned for its wide anechoic bandwidth and physical size. A specially designed floor provides realistic simulation of surface wave propagation - a unique capability.

Fire Support System Integration Lab - Designed for end-to-end weapon system hardware check out, this facility contains distributed, netted communication nodes which can perform high and low level system tests. The facility is currently uniquely configured to check out the MLRS family of munitions.

Army Missile Optical Range - A one of a kind, very large aperture (2m) compact laser range capable of illuminating large targets, under simulated far field conditions, at short range. This facility is used extensively for measurement of Strategic Defense Targets.

UAV System Integration Laboratory - A world class facility unique in its ability to integrate multiple UAV systems and test common subsystem integration interfaces.

Weapon System Interoperability Test Facility - Designed for weapon system software and communication testing, this is the only facility in the U.S. Government having, in residence, Army deployed tactical air defense systems, Unmanned Aerial Vehicle C3 assets, and other ground and fire support weapon and C3 systems. It is regularly used for joint interoperability certification testing, AWE and field demonstration preparation, and soldier training.

Composites Manufacturing Facility - Wholly Government owned and operated, the Composites Manufacturing Facility provides MRDEC engineers with a 'hands on' capability in missile composites manufacturing from project concept, through fabrication, and testing. This facility is the Government's principal repository of technical expertise in this area.

Propellant Signature Characterization Facility - This environmentally controlled 'smoke tunnel' is used by all Services to evaluate contractor propellants and conduct detailed analysis of propellant insensitive munition properties.

EQUIPMENT/FACILITIES (continued)

Automated Manufacturing Cells - Contains a uniquely automated, fiberoptic winding capability and a cell for automated inspection of printed circuit boards down to 1-2 mils line width.

Laser Induced Chemistry Facility - Unique facility which includes lasers covering ultraviolet to infrared and analytical instrumentation to identify compounds resulting from laser induced reactions.

Laser Range - The Physical Sciences Building was designed for high energy laser operation. A laser range was built behind the building which allows the operation and use of the range from inside the building either by the hi-bay or directly from the lab. The range is approximately 1720 ft long with four islands each with a large mirror mount and electricity. A concrete bridge designed to support an M1 tank connects the islands with the hi-bay area. Access to the range is restricted by chain link fence and interlocks on the interior doors. Warning lights are positioned down the centerline of the range and on the access doors and gates.

Automated Laser Seeker Performance Evaluation System (ALSPES) - This \$2M, one-of-a-kind facility provides complete open-loop test capability for semi-active laser (SAL) seekers/sensors operating at 1.064 microns. ALSPES provides characterizations on prototype/R&D hardware including specification compliance requirements, functional performance, and active electro-optical countermeasures (EOCM) susceptibility, and it has taken a commanding lead in EOCM susceptibility analysis. The facility has been used to test/characterize both foreign and domestic hardware, such as Copperhead, HELLFIRE, HELLFIRE II, Krasnopol, Vehicle defensive-aid suites, and 2.75" laser guided rockets. The modular equipment/software interface allows numerous systems to be tested with minimal changeover downtime.

The Laser Guidance Analysis Facility - This facility, which provides for real time, closed loop evaluation of semi-active laser guidance hardware, has and continues to be instrumental in the development and life cycle support of such systems as HELLFIRE and Copperhead. It is currently being utilized in the development and demonstration of new laser guidance concepts for the LCPK 2.75 Inch Guided Rocket program.

Missile Research, Development & Engineering Center

Redstone Arsenal, AL 35898-5241

(205) 955-6805

Tech. Director: Dr. William C. McCorkle

Assoc. Director: Dr. Larry O. Daniel

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	1.126	NA	NA	1.126
6.1 Other	0.004	0.000	1.332	1.336
6.2	11.094	0.965	23.997	36.056
6.3	10.422	3.762	119.301	133.485
Subtotal (S&T)	22.646	4.727	144.630	172.003
6.4	7.164	5.261	18.030	30.455
6.5	11.398	6.666	36.629	54.693
6.6	3.196	1.435	33.831	38.462
6.7	6.378	3.873	17.890	28.141
Non-DOD	0.713	0.000	2.042	2.755
TOTAL RDT&E	51.495	21.962	253.052	326.509
Procurement	45.432	NA	41.862	87.294
Operations & Maintenance	11.913	NA	22.098	34.011
Other	15.901	NA	40.037	55.938
TOTAL FUNDING	124.741	21.962	357.049	503.752

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

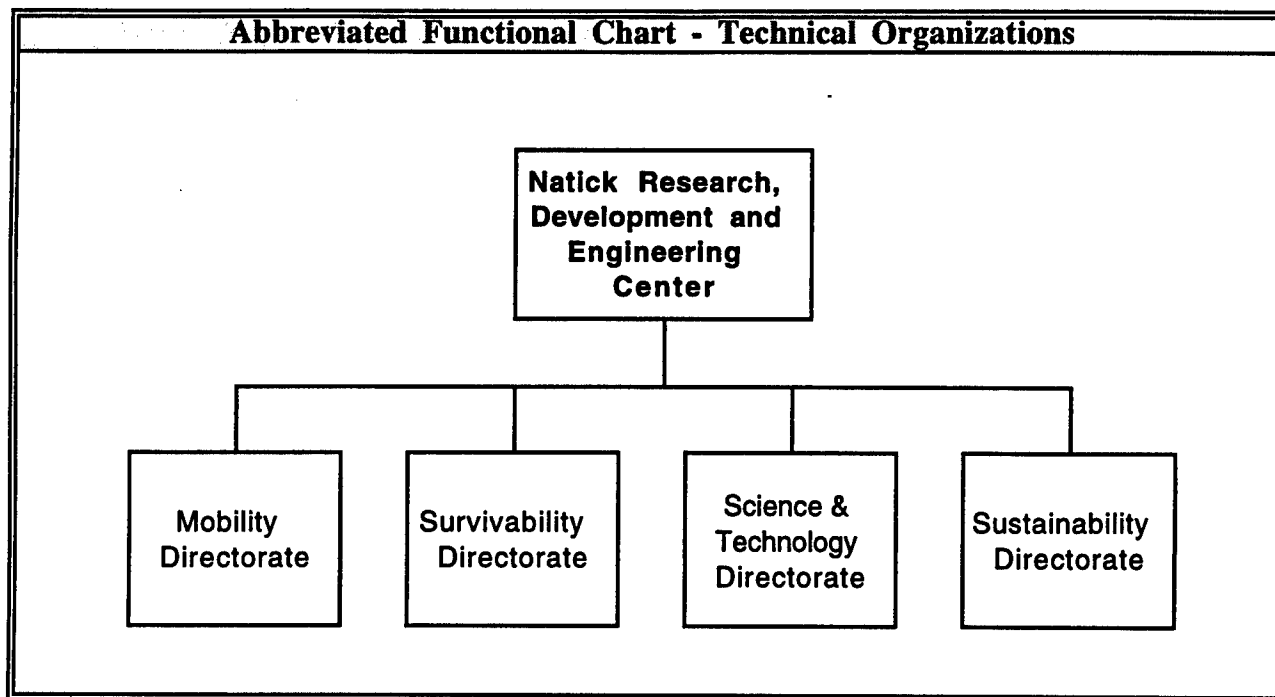
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	7	0	7
CIVILIAN	37	1,189	522	1,748
TOTAL	37	1,196	522	1,755

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	974.866	REAL PROPERTY	227.797
ADMIN	237.330	* NEW CAPITAL EQUIPMENT	0.740
OTHER	143.587	EQUIPMENT	346.248
TOTAL	1,355.783	* NEW SCIENTIFIC & ENG. EQUIP.	5.791
ACRES	4,000	* Subset of previous category.	

NA = Not Applicable

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Natick Research, Development & Engineering Center



Natick Research, Development & Engineering Center

Natick, MA 01760-5000

(508) 233-4300

Acting Director: Mr. Philip Brandler

Deputy Director: _____

MISSION

NRDEC's mission is to research, develop, engineer, test, evaluate, and integrate the best technologies for warrior systems that enhance individual combat effectiveness and quality of life. Our core products include food, shelters, airdrop, individual protection, field service and other warrior-related technologies and systems. Key services include integration of all individual warrior-related technologies and systems for everything the warrior wears, carries, "jumps" and consumes, and related support equipment.

NRDEC is the executive agent for the Department of Defense's (DOD) Food and Nutrition Research, Development, Testing, and Engineering Program as well as a DOD Center of Excellence for Clothing & Textiles. Additionally, NRDEC is the DOD agency for Helicopter Sling Loading and the Army agent for Internal Air Transport Certification.

CURRENT IMPORTANT PROGRAMS

1. Develop technologies for insertion into 21st century integrated, modular, individual fighting systems that link the soldier to the digitized command and control network on the battlefield of the future. The Force XXI Land Warrior (LW) S&T program efforts focus on technology insertions to the architectural backbone of the system with microelectronics and telecommunications to achieve lightweight, miniaturized components. The Military Operations in Urban Terrain (MOUT) program encompasses a breadth of technologies including advanced individual precision weapons, combat identification, counter-sniper technologies, nonlethal weapons, and advanced sensors, situational awareness and personal protection. The operational capability realized will be a series of advanced systems or components forming a MOUT "System of Systems" to ensure effective interoperability and functionality.

2. Maximize the warrior's survivability through development of integrated, modular system components that provide individual protection from ballistic, percutaneous chemical and biological, environmental, flame, surveillance, and directed energy threats.

One Cooperative Research and Development Agreement (CRDA) supports ballistic protective fibers produced through genetic engineering techniques for ballistic impact applications. Four new CRDAs are in place to support the RDT&E of new materials and configurations for protective clothing and individual equipment systems.

3. Provide soldiers with systems that enhance combat readiness and quality of life in the field through the development, integration, and fielding of advanced field services equipment and base camp systems in all environments and field conditions.

4. Develop a family of performance-enhancing combat rations (special-purpose and standard individual/group) and modularized, rapidly deployable field feeding equipment/systems (kitchens, burners, sanitation) for all the services to support the full spectrum of tactical scenarios.

CURRENT IMPORTANT PROGRAMS (continued)

12 CRDAs support combat rations and field feeding R&D innovative methods to provide processed meals in microwave retort pouches, irradiation, radio frequency, and non-thermal processes in the preservation of foods; improved capability for preparing special microencapsulated performance-enhancing nutrients; shelf-stable, eat-out-of-hand ration components; candidate replacements for the Flameless Ration Heater (FRH); and research for the production of fresh-like fruit and vegetables with reduced weight and volume.

5. Enhance the mobility of the combatant with the following systems: terrain traversal, personnel augmentation equipment, personnel airdrop, and cargo airdrop.

One CRDA supports airdrop R&D in the area of cushioning airdrop payloads by using gas-injected airbag technology. Another CRDA is using a phased approach to explore the flight control characteristics of high glide, semi-rigid wings, and to assess the feasibility of increasing range by use of a glide augmentation system.

6. Develop advanced shelters and shelter systems that provide new capabilities or enhancements, such as high-pressure, airbeam-supported maintenance shelters (lighter weight, less cube, quicker erection); command posts; and collective protection medical treatment facilities and hospital complexes.

EQUIPMENT/FACILITIES

Unique facilities at Natick include: man-rated climatic chambers capable of simulating world-wide environmental conditions; the Defense Simulation Internet (DSI) Facility which connects to the worldwide DSI for inserting fully outfitted dismounted infantrymen into the world of distributed interactive simulation; the aircraft and airdrop load roller conveyor, static, and drop test facilities; the soft shelters prototype fabrication facility which has many unique state of the art tentage fabrication machines and tools, including radio frequency fabric welders, hot wedge and hot air seam sealers, and is collocated with the rain test tower; food packaging facilities capable of prototype plant scale operations and simulation of rough handling; food processing pilot plant facilities; the food service equipment, engineering and evaluation lab including hooded work areas for chemical and combustion testing, a machine shop, an energy utilization panel, portable diagnostic and gas measurement instruments, and sound levels equipment; a complete laser laboratory with an alexandrite (variable frequency) laser; a fiber spinning and recycling facility; a dyeing, printing, and finishing fabrics pilot plant; a seams lab; a microbiology lab with a molecular modeling graphics workstation; a biotechnology lab with automated respirator; fermentation facility; a microscopy lab with optical, electron, and atomic force microscopes; a taste test lab; and a terrain analysis system.

Other equipment at Natick includes spectrophotometers, a CCD camera imaging system, robotic chemical agent stimulant materials test apparatus, oligonucleotide & peptide synthesizers, peptide sequencers, thermal analysis equipment, chambers for simulating artificial light, multi-layer film extrusion system, ballistics high speed impact test equipment, a materials testing machine (100 lb capacity), a computer video-analysis system, three-dimensional head and full body scanners, instrumented manikins, a small flight test/ultralight aircraft, a computerized pattern generating and grading system, a computerized rapid prototype machine, a twin screw extruder, and chromatographs with capabilities including GC, GC/MS, GDC, and HPLC.

EQUIPMENT/FACILITIES (continued)

BIOMECHANICS LABORATORY. This unique lab was established jointly by Natick and the U.S. Army Research Institute of Environmental Medicine (USARIEM). This Center for Military Biomechanical Research, the only facility of its kind within DOD, is designed for the study of ergonomic aspects of clothing and individual equipment, occupational medicine, and physical performance.

FUEL CELL. Selected as one of the DoD national test program sites for fuel cell technology, Natick became home to New England's first electricity-generating, nonpolluting fuel cell. The hot water is used by the steam distribution systems for heating and cooling. Use of the fuel cell technology will improve air quality and reduce costs by \$70,000 per year.

Natick Research, Development & Engineering Center

Natick, MA 01760-5000
(508) 233-4300Acting Director: Mr. Philip Brandler
Deputy Director: _____

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.392	NA	NA	0.392
6.1 Other	1.432	0.035	0.303	1.770
6.2	8.968	0.690	18.162	27.820
6.3	3.282	0.535	20.263	24.080
Subtotal (S&T)	14.074	1.260	38.728	54.062
6.4	3.712	0.173	2.969	6.854
6.5	6.388	0.413	6.118	12.919
6.6	0.549	0.060	1.833	2.442
6.7	0.139	0.000	0.000	0.139
Non-DOD	3.703	0.120	13.984	17.807
TOTAL RDT&E	28.565	2.026	63.632	94.223
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	13.119	NA	4.662	17.781
Other	0.000	NA	0.000	0.000
TOTAL FUNDING	41.684	2.026	68.294	112.004

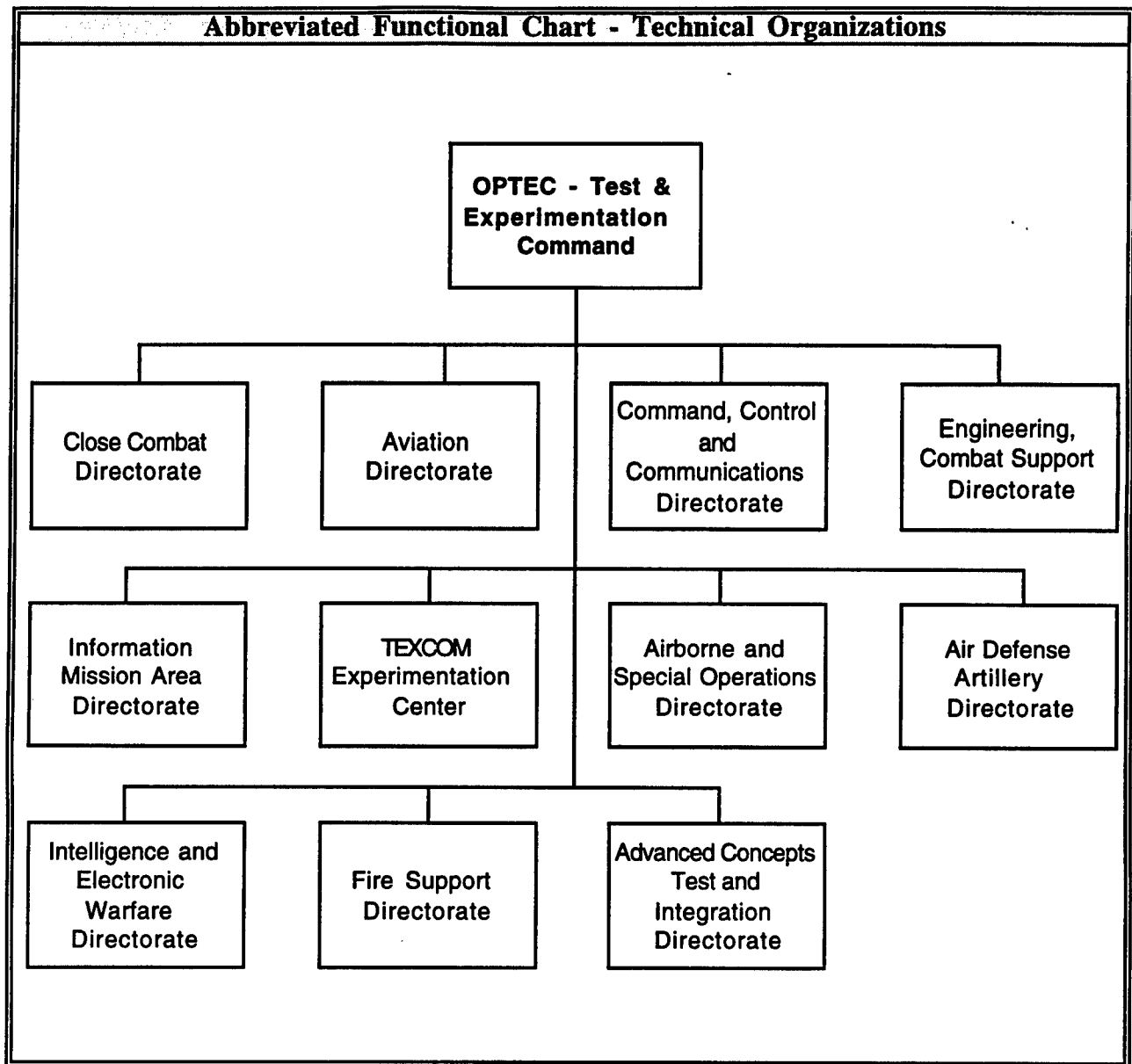
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	9	24	33
CIVILIAN	10	129	270	409
TOTAL	10	138	294	442

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	368.474	REAL PROPERTY	18.902
ADMIN	32.336	* NEW CAPITAL EQUIPMENT	0.000
OTHER	23.786	EQUIPMENT	2.496
TOTAL	424.596	* NEW SCIENTIFIC & ENG. EQUIP.	0.455
ACRES	58	* Subset of previous category.	

NA = Not Applicable

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OPTEC-Test and Experimentation Command

OPTEC-Test and Experimentation Command
Fort Hood, TX 76544-5065
(254) 288-1304

Commander: BG R. A. Glacel
Technical Director: Brian Barr

MISSION

Support the Army material acquisition and force development processes by executing the User Testing Program and conducting operational testing to support force development.

CURRENT IMPORTANT PROGRAMS

ANDVT	Advanced Narrowband Digital Voice Terminal (AIRTERM/KY-100)
AKMS	Automated Key Management System
ASV	Armored Security Vehicle
ATCCS VI	Army Tactical Command and Control System
BFVS A3	Bradley Fighting Vehicle
BIDS P3I	Biological Integrated Detection System
CCTT	Close Combat Technical Trainer
DIV XXI	Division XXI
EMUT	Enhanced Manpack Ultra-High Frequency Terminal
FBCB2	Force Battle Command Brigade and Below
ISYSCON	Integrated System Control
IVMMD	Interim Vehicle Mounted Mine Detector
MAIS	Mobile Automated Instrumentation Suite
MICAD	Multipurpose Integrated Chemical Agent Alarm
RAH-66	Comanche Helicopter
TF XXI	Task Force XXI

EQUIPMENT/FACILITIES

Position location, high angle modular integrated target, video, data acquisition and reduction, thermal imaging, fiber optics and video multiplexer/demultiplexer, range timing, microwave, environmental measurement and survey.

OPTEC-Test and Experimentation Command
Fort Hood, TX 76544-5065
(254) 288-1304

Commander: BG R. A. Glacel
Technical Director: Brian Barr

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	48.400	0.000	0.000	48.400
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	48.400	0.000	0.000	48.400
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	50.900	NA	0.000	50.900
Other	0.000	NA	0.000	0.000
TOTAL FUNDING	99.300	0.000	0.000	99.300

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

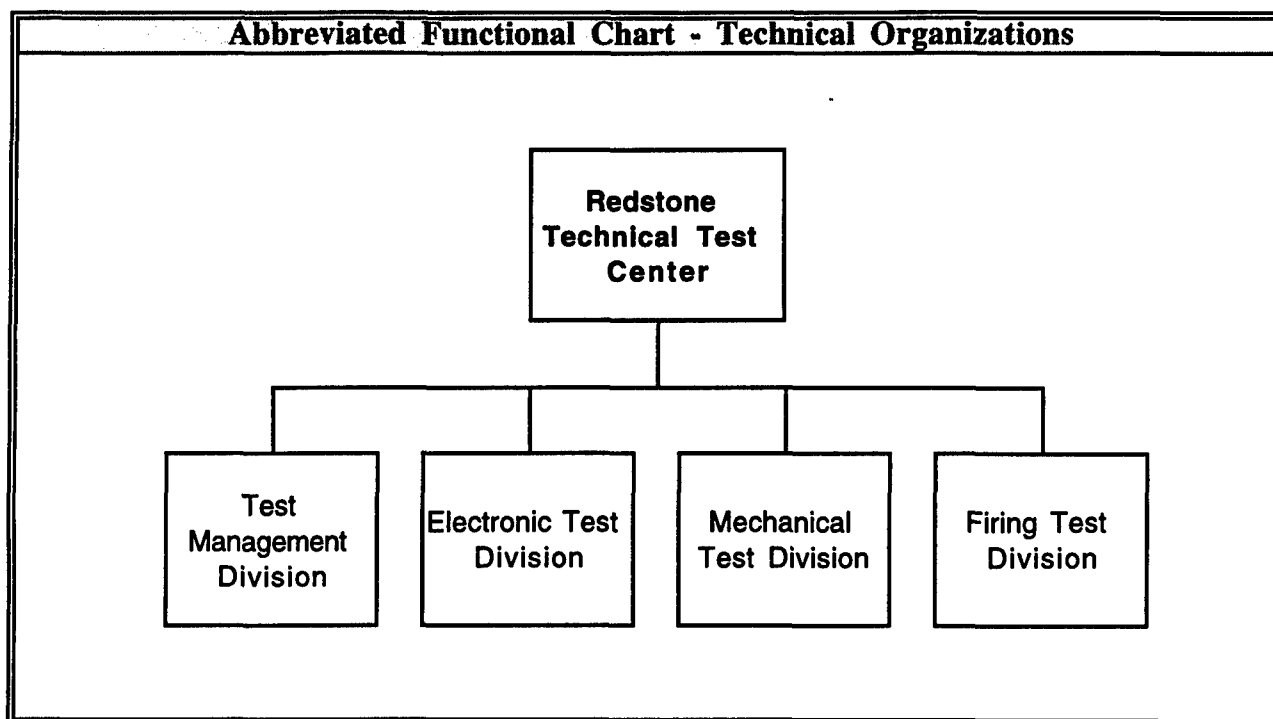
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	386	386
CIVILIAN	1	94	522	617
TOTAL	1	94	908	1,003

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	19.900	REAL PROPERTY	6.300
ADMIN	41.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	0.000	EQUIPMENT	3.000
TOTAL	60.900	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	22	* Subset of previous category.	

NA = Not Applicable

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Redstone Technical Test Center



Redstone Technical Test Center
Redstone Arsenal, AL 35898-8052
(205) 876-4482

Acting Director: Carl E. Roberts
Acting Deputy Director: Terry B. Farris

MISSION

Plan, conduct, analyze, and report the results of technical tests of subsystems and components of major weapon systems and associated systems/materials; conduct life cycle technical testing of small rockets/guided missiles, and serve as DOD Lightning Test Facility for hazardous items. RTTC provides testing and test support for rocket and missile research, development, test, and evaluation and other missions of authorized customers within the Department of Defense and outside the DOD, to include government and non-government organizations, domestic and foreign.

CURRENT IMPORTANT PROGRAMS

Air-To-Ground Missile System (HELLFIRE).
Air-To-Ground Missile System (LONGBOW).
TOW Missile System.
Improved Target Acquisition System (ITAS).
Improved Bradley Acquisition Subsystem (IBAS).
Javelin Missile System.
Multiple Launch Rocket System (MLRS).
ATACMS/BAT.
MPIM SRAW.
AMCOM Missile Repair Parts Program.
AMCOM Missile Shelf Life/Surveillance Program.
Enhanced Fiber Optic Guided Missile (EFOG-M).
M72.
Bunker Defeat Munition (BDM).
FOTT.
Super Dragon.

EQUIPMENT/FACILITIES

Extensive equipment/instrumentation for performing complete functional tests in the laboratory and field, of weapon system subsystems and components including IR, millimeter wave, and laser seekers and guidance sections, IR and visual target acquisition systems, antennas, fire control systems, gyroscopes, batteries, electronic and mechanical safe and arm devices, passive components, circuit cards, integrated circuits and other electronic, mechanical, optical, and RF devices. Testing can be accomplished at environmental extremes and test methodology is rapidly expanding to incorporate hardware-in-the-loop (HIL) and state-of-art modeling and simulation (M&S) techniques to project subsystem/component test data to system level performance. Specialized and automated test instrumentation is available/can be developed for particular weapon system application in either a laboratory or remote site environment. Flight test ranges up to 8KM are fully equipped with video and film fixed and tracking cameras, Doppler radars, GPS, telemetry and hard-line instrumentation, and tactical and simulated air and ground targets. A simulation/Test Acceptance facility provides a unique, non-destructive HIL test capability for acceptance testing of all-up-round (AUR) MMW-guided missiles. A 2000 acre, 5KM, laser/optical range for designator/sensor testing has an elevated mound, a 75 ft tower with enclosed 2-story cab, and equipment/instrumentation/aircraft for captive carry and dirty battlefield scenarios. State-of-art instrumentation is available to accurately determine aircraft/target/sensor positions, provide atmospheric transmission measurements, determine target-to-background contact measurements, and provide target thermal signatures. Development of high resolution, three dimensional, interactive, validated terrain models of RTTC ranges in the visual, infrared, and MMW bandwidths is in progress. Facilities for static and dynamic warhead testing are fully equipped with speed cameras and flash radiography. Full range of equipment/chambers is available for nondestructive and climatic testing. Static test facilities can accommodate static and liquid rocket motors up to 150K pounds vertical thrust and 10M pounds horizontal thrust. Rocket motor dissection capability exists and a thermal ablative/ducted rocket engine test facility is nearing completion. Dynamic test capabilities include vibration, shock, drop, centrifuge, and rail impact testing. E3 facilities conduct EMRH/EMRO, EMI, antenna and RCS measurements. A radar Environment Emulation system housed in a broadband, 100 DB shielded, anechoic chamber provides capability to test weapon systems to high power, pulse modulated EMR environments.

Redstone Technical Test Center
Redstone Arsenal, AL 35898-8052
(205) 876-4482

Acting Director: Carl E. Roberts
Acting Deputy Director: Terry B. Farris

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	26.623	0.000	0.000	26.623
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	26.623	0.000	0.000	26.623
Procurement	20.229	NA	0.000	20.229
Operations & Maintenance	2.416	NA	0.000	2.416
Other	8.239	NA	0.000	8.239
TOTAL FUNDING	57.507	0.000	0.000	57.507

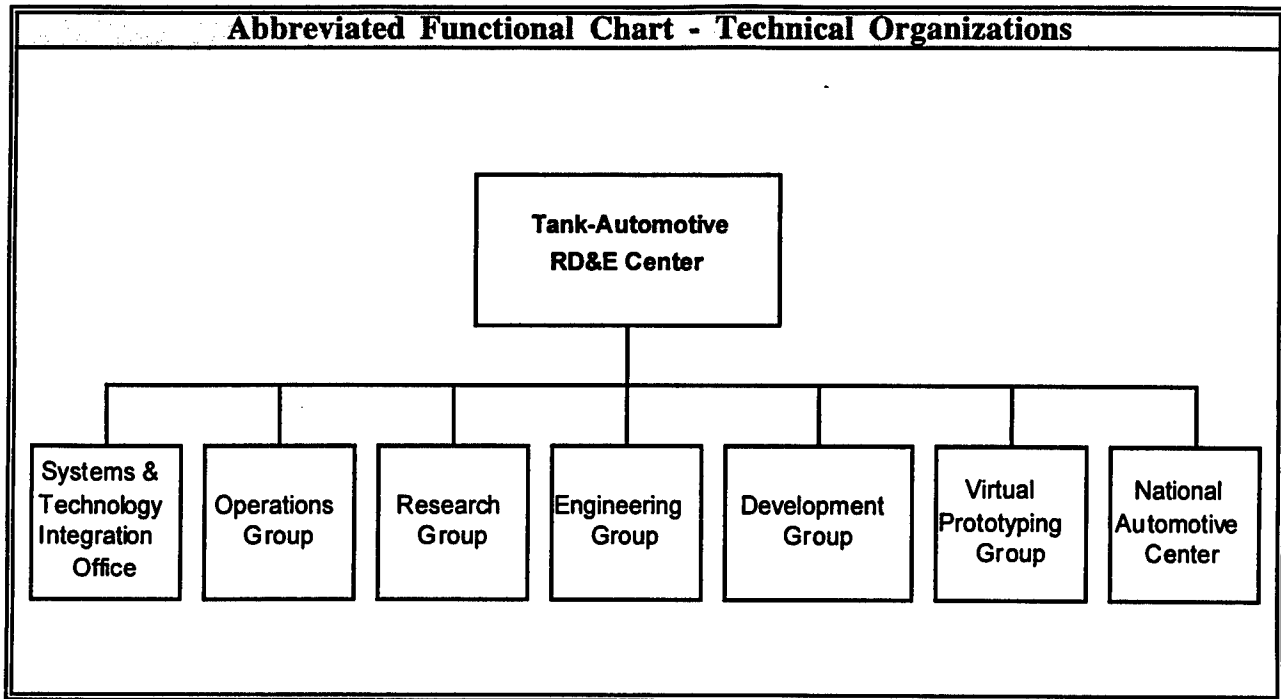
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	0	0
CIVILIAN	0	94	56	150
TOTAL	0	94	56	150

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	460.000	REAL PROPERTY	146.000
ADMIN	52.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	133.000	EQUIPMENT	0.000
TOTAL	645.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	14,000	* Subset of previous category.	

NA = Not Applicable

Tank-Automotive Research, Development & Engineering Center



Tank-Automotive Research, Development & Engineering Center

Warren, MI 48397-5000
(810) 574-5663

Commander: MG Roy Beauchamp
Director: Jerry L. Chapin

MISSION

Conduct research, development, engineering and leverage advanced automotive and logistics technology to provide our soldiers with the world's technologically superior ground vehicle systems and logistics support equipment.

Provide the life-cycle management, engineering, and technical support necessary to guarantee continuous system's readiness.

Serve as the Army's focal point for all ground system integration of all supporting technologies and subsystems as well as the development of dual-use automotive technologies and their application to military ground vehicles.

Provide life-cycle management, engineering and technical support necessary to guarantee continuous systems readiness.

Respond to our customer and the broad concerns of the public while providing a safe working environment for our associates.

Conduct our operations prudently and provide quality products and services which meet our customer's expectations.

CURRENT IMPORTANT PROGRAMS

In FY97, TACOM-TARDEC was responsible for five Defense Technology Objectives (DTOs) as well as 6% of the Army's 200 STOs which include four Advanced Technology Demonstrations (ATDs). The five DTOs for ground vehicles are: Advanced Ground Vehicle Systems, Ground Vehicle Integrated Survivability, Advanced Ground Vehicle Mobility Systems, Ground Vehicle Electronic Systems, and Ground Vehicle Chassis and Turret Technologies. The four ATDs consist of the Composite Armored Vehicle ATD, Hit Avoidance ATD, Crewman's Associate ATD, and Future Scout and Cavalry System (FSCS) ATD.

-- **ADVANCED TECHNOLOGY DEMONSTRATIONS (ATDs)** focus TARDEC's Science and Technology (S&T) programs on current and future customer requirements while showcasing technological opportunities for advanced ground vehicle warfighting capabilities. Composite Armored Vehicle (CAV): A new benchmark in lightweight, ground combat vehicle structures and armor was achieved with the rollout of the CAV demonstrator on 18 Feb 97. The CAV demonstrator structure has a measured 35% weight savings versus an all metallic structure with equivalent ballistic protection. Test results of the demonstrator radar and thermal signatures have met or exceeded expectations by combining the structure design and material solutions. Automotive testing has been completed and initial durability testing is in progress. Composite technology transfer has occurred with the incorporation of CAV technology into the current Crusader howitzer turret design. Ongoing and future technology transition efforts will concentrate on the Future Scout Cavalry System (FSCS) as well as the Future Infantry Vehicle (FIV).

CURRENT IMPORTANT PROGRAMS (continued)

The Future Scout and Cavalry System (FSCS) ATD concept development, technology tradeoff assessments and program formulation began this year. In FY98 the ITT (RFP) will be finalized and released to Industry and a Source Selection will be accomplished. Two ATD contracts will be awarded. Cost tradeoffs and initial design will be accomplished in FY99. This ATD will be cooperatively executed with the United Kingdom. Specific international roles and responsibilities have been established.

The Hit Avoidance (HA) ATD has completed demonstrations in signature management, electronic warfare, and active protection technologies. The integration of these technologies known as the Integrated Defense System (IDS), provides the vehicle crew with the capability to automatically detect threats and position thus offering increased vehicle and crew survivability. We developed and demonstrated a sensor module pertaining to hit avoidance technologies for ground vehicles, conducted a system demonstration of protection concepts, demonstrated a low-cost near-term active protection system, developed system specifications for the IDS, demonstrated the IDS decision aid and provided system specifications, evaluated systems engineering simulation models developed through the integration of threat, sensor, countermeasure and ancillary support models, demonstrated and evaluated a commander's decision aid which identifies the threat and then provides an optimal countermeasure response. We are continuing to examine Armor/Anti-Armor Technology, Threat Oriented Survivability Optimization Model (TOSOM), Laser Protection Ground Vehicle Visual Perception, and Non-Ozone Depleting Substance Technology to further enhance survivability in the field.

Crewman's Associate ATD was successfully completed on time and within cost by the end of the fiscal year, and demonstrated crew station performance enhancements through the application of advanced technologies compared with current M1A2 four-man crew performance. The end product will be a Systems Integration Lab (SIL) that demonstrates how electronics integration, user-friendly interface, and advanced digital information handling systems can be combined so that the crew can fight and win the information war.

-- **TECHNOLOGY DEMONSTRATIONS** are comprised of TARDEC's non-ATD S&T programs and are formulated by Army agencies as a Science and Technology Objective (STO). Individually approved by the warfighting customer, each STO delivers a measurable new warfighting capability or a cost saving method to streamline ground vehicle acquisition and support investments. New STOs currently under development and that have attained provisional status from the warfighter customer include full spectrum active protection - a universal combat vehicle defensive system; propulsion demonstrator for future combat system - technologies demonstration to meet future combat system mobility and power requirements; advanced electronics for future combat systems - ultra high power electronics and crew station architecture; light weight chassis and turret structures - high efficiency, minimum weight, modular structural designs for ground combat vehicles; and future combat system integrated demonstrator - system integration demonstration of the above advanced subsystems technologies. Other non-STO efforts include robotic ground vehicle and Halon replacement. The new robotic effort was initiated to develop and demonstrate robotic ground vehicle technology extended to autonomous navigation on off-road terrain. Development and demonstration continues for a crew compartment explosion and fire suppression agent replacement of Halon 130.

CURRENT IMPORTANT PROGRAMS (continued)

-- **TECHNOLOGY DEVELOPMENT:** The Ground Vehicles subarea of the 1997 DOD Ground and Sea Vehicles Defense Technology Area Plan (DTAP) identifies unique technology efforts, called Defense Technology Objectives (DTOs), critical to fielding of technologically superior warfighting systems. In FY97, three additional DTOs were added in DTAP to the five of the previous year. The new DTOs are integrated hit/kill avoidance optimization; reconnaissance, surveillance and targeting vehicle; and tactical mobile robotics. Again this year, the ground vehicle Science and Technology investments were consolidated in a planning document entitled Technology Development Approached (TDA). The TDA represents an integrated Science and Technology investment by Government, Industry and Academia for ground vehicles. The TDA identifies soldier needs, unique technology opportunities and establishes, by a consensus decision-making process, quantified technology goals with resultant ground vehicle system payoffs. The product of the TDA is a set of technology programs, e.g. STOs and ATDs, which are focused on high payoffs efforts and maintain a consistent direction over multiple budget years. A full team of Government, Industry and Academia representatives met for the first time in this year to review and comment on the TDA and to exchange ideas.

-- **VEHICLE PERFORMANCE SIMULATION/VIRTUAL PROTOTYPING** efforts are centered on exploiting advances in High Performance Computing and Simulation software to analyze and assess wheel and track ground vehicle performance over the entire life cycle of the vehicle system, from concept design through fielded system support. Our expertise in multi-body/flexible body analysis as well as finite element/structural analysis is used to analyze engineering issues as finite as individual component performance, on up to whole vehicle system performance. Our expertise is used extensively to provide new vehicle system Source Selection Authorities additional insight into how proposed vehicle designs will perform while carrying out their directed missions. We are also called in to support Weapon System Managers, Program Managers and other decision makers to provide engineering solutions to problems in the field which preclude their system from meeting their mission requirement. Many of the state of the art simulation tools we have at our disposal have been developed by the Researchers with TACOM-TARDEC's Virtual Prototyping group as part of our ongoing research program that keeps the Army's Simulation capabilities on the cutting edge of the technology. This technology allows TACOM-TARDEC to provide vehicle system decision makers with timely, accurate answers to their real world engineering questions, thereby keeping the Army's vehicle fleet the safest, and most effective in the world.

-- **EMERGING SYSTEMS** are based on recommendations of warfighter-lead Integrated Concept Teams (ICTs) sponsored by the US Army Training & Doctrine Command (TRADOC). ICTs this year focusing on future systems include: Future Combat System (FCS), Future Scout & Cavalry System (FSCS), and Future Infantry Vehicle (FIV). An ICT also proposed upgrades to the M1 Abrams Main Battle Tank. In addition to ICT recommendations, a Petroleum Quality Analysis system is an emerging logistic system initiated with strong backing from the Combat Service Support warfighter organizations.

- Provided concept and manufacturing drawings, and built prototype combat identification panels for tracked vehicles, and for the HMMWV; designed, produced and fielded combat identification panels to U.S. Army Europe Units.

- Provided mine resistant components and panels to the soldiers in Bosnia and other locations. These vehicles were provided to allow greater survivability in areas with high concentrations of land mines as experienced in Bosnia and other overseas locations.

CURRENT IMPORTANT PROGRAMS (continued)

-- **SUPPORT TO PEO's** ie. M1A2 System Enhancement Package (SEP), Bradley M2A3, includes Digitization of the Battlefield, Heavy Dry Support Bridge, Tactical Vehicle Mine Protection.

Other Support to PEOs:

- Provided electronics architecture and/or embedded mapping consultation to PMs for Abrams, Bradley and CMS.
- Developed and provided digital map editing station to provide usable, integratable DMA-based maps for embedded vehicle use by PM Abrams and Bradley during M1A2 SEP and M2A3 test and evaluation.
- A PLS-based DEMO III truck full scale hardware development and integration effort has been completed including up horsepower, new transmission, independent suspension, disc brakes and concepts for weight reduction.

-- **WEAPON SYSTEM MANAGEMENT and CONFIGURATION CONTROL** for 19 systems in development, 34 systems in production/deployment and 2801 systems in sustainment(vehicles and end items). This encompasses over 850,000 military ground vehicles, 300,000 unique spare parts equating to 2.5 billion components (average of 3,000 parts per vehicle). Configuration control is maintained via 934,000 drawings. System support includes: materiel & combat development integration, acquisition, concurrent engineering, manufacturing & producibility engineering, product assurance, engineering data management, validation of technical data, field technical assistance, specifications and standards, tech adaptation/development/integration/transition and test management.

-- **TECHNOLOGY TRANSFER EFFORTS:**

- Participated in a joint military/commercial light truck demonstrator program, using advanced commercial technologies.
- Continued development, demonstration and deployment of the Automotive Product Development Framework (APDF), a comprehensive, integrated virtual prototyping system for ground vehicles with advanced capabilities to automatically integrate and operate existing, dissimilar software products in a unified operating environment.
- Demonstrate new environmentally compliant and pollution prevention initiatives for petroleum and related products by introducing recycling capabilities for DOD and new non hazardous/non toxic petroleum product substitutes.
- Demonstrated military ground vehicle and missile applications of selectively reinforced, silicon carbide whisker - aluminum metal matrix composite (AL-MMC) materials.
- Continued joint TARDEC/industry projects to prolong lead-acid battery life, and to reduce their use, through ultracapacitor starting aids, smart electronic battery management, and modeling tools which improve vehicle electrical system behavior.
- Organized a night vision conference with participation of our industry partners to demonstrate successful technical transfer accomplishments.
- Continued research in several areas of diesel engine technology including the evaluation of the High Output Diesel Engine and the insertion of advanced automotive technologies to the Army vehicle fleet to reduce operation and support cost.
- Continued participation in the Partnership for a New Generation of Vehicles (PNGV) for systems analysis, four stroke directed injected engine and manufacturing.
- Initiated development of an environmentally friendly, low cost waste oil disposal system with recovery of residual waste oil energy for vehicle use.

EQUIPMENT/FACILITIES

TARDEC is the only Army/DOD Tank-Automotive Research, Development and Engineering Center committed to overall ground vehicle technology and integration.

NATIONAL AUTOMOTIVE CENTER, a joint venture with the American automotive industry and TARDEC, is leading the way in 'dual use' of critical technologies.

PROPULSION LABORATORY: Has six R&D computer-controlled engine and transmission test cells, three vehicle test cells and an airflow lab featuring a chassis dynamometer facility, a truck driveline test cell, a unique environmentally-controlled large-tracked vehicle dynamometer test chamber with wind, ambient temperature, and solar radiation simulation capability, brake, heat exchanger, air cleaner, and battery testing facilities.

TIRE LABORATORY: Provides full range of tire and roadwheel performance, endurance, and shock testing capability.

TRACK and SUSPENSION LABORATORY is used to conduct testing and evaluation of current and prototype combat vehicle components. Specific test systems include a track pad test machine, 1/4 HMMWV suspension test platform, three degree of freedom track loading, torsion bar test and linear shock absorber test. Generic capabilities are available for high static loading and endurance/fatigue test scenarios. Available linear and rotary hydraulic components and instrumentation allow for flexible test design and configuration.

ARMOR INTEGRATION LAB performs armor system fabrication and ballistic testing.

VISUAL PERCEPTION LABORATORY augments available field test data by providing a controlled environment to measure the detectability of signature management systems using trained military observers.

LASER PROTECTION LABORATORY develops and evaluates materials and techniques to harden combat vehicle surveillance vision optics against multiple laser hazards and threats.

ENVIRONMENTAL TEST CELL performs high-temperature performance tests on vehicles.

VEHICLE ELECTRONICS (VETRONICS) LABORATORIES include: Combat Vehicle Systems Integration Lab composed of ADA based vehicle-ready electronics, computer systems, and crew stations for proof-of-principle demonstrations of advanced and open electronic architecture approaches; Crew Station Simulator Lab composed of the following DIS compatible man-in-the-loop virtual simulators and support environments: 2/3 Man Tank, M2A3 HMMWV, MODSAF, ITEMS and virtual world/terrain modeling; Drivers Automation Lab composed of several tactical wheeled and combat vehicle systems with a variety of autonomous and semi-autonomous driving aids and sensors (e.g. collision avoidance system) and a base station for tele-operated field demonstrations.

COMBAT VEHICLE COMMAND AND CONTROL FACILITY provides an automated command and control system for armor/infantry vehicles, a tactical situation display in all vehicles, and supports the Army Horizontal Technology Insertion Program.

EQUIPMENT/FACILITIES (continued)

TACOM GROUND VEHICLE SYSTEMS SIMULATION LABORATORY houses national resources for full-scale motion based vehicle simulation. The laboratory consists of a variety of simulators to perform Man-in-the-loop crew stations turret motion base simulator CS/TMBS is the center piece of this laboratory. This unique 6 degree of freedom simulator is used to reproduce dynamic conditions encountered by combat vehicle crew stations and turret systems (up to 25 tons) traverses a variety of terrain environments. In addition to the CS/TMBS, a ride motion simulator (due to be installed FY98), a single crew person, six DOF high fidelity simulator, offers the capability of recreating the ride motion of any land based military vehicle system. In order to perform durability schedules, reconfigurable "poster" simulators are used to provide dynamic load inputs to ground vehicle systems and/or subsystems (tanks/trucks, hulls, frames, etc). In order to better test trailer systems, the laboratory has yet another unique one-of-a-kind simulator the Pintle Motion Base Simulator (PMBS). The PMBS is capable of providing both terrain disturbance inputs and dynamic pintle loads due to truck/trailer interaction.

The TACOM HIGH PERFORMANCE CENTER (HPC) which operates a 64 processor Power Challenge Array (PCA) Parallel Processor Super computer is Collocated in this facility and is one of only eleven DOD national shared-resource high-performance computer centers. In addition, this center provides computational capability for real time inputs needed by the Ground Vehicle System Simulation Laboratory.

TACOM-TARDEC VIRTUAL PROTOTYPING LABORATORY is capable of displaying interactive computer-aided design solid model virtual mock-up of present and future ground vehicle systems. A wide range of state-of-the art 3-D stereo display devices (helmet, boom, projection, and holographic) are used for interactive virtual mock-up of vehicle systems and manufacturing facilities. In addition state-of-the art CAD work stations directly networked to the HPC PCA will allow real-time interactive immersive environments for virtual mock-up of vehicle systems.

BRIDGE TEST FACILITY used in testing static or dynamic cyclic loads on various bridge designs.

WATER QUALITY AND WATER TEST CELL LABORATORIES used for the testing of various water filter elements, water filter systems, and provides chemical analytical support to water purification engineer functions.

FUEL EQUIPMENT TEST LABORATORY used for testing and evaluating fuel pumps, fuel filter elements, fuel filter separators, fuel nozzles and engine fuel filter elements.

GREASE AND FLUID LABORATORY performs development, evaluation, and environmental compliance assessments of hydraulic fluids, semi-solid lubricants, solid lubricants, antifreeze, and solvents to enable introduction of new technologies and development of new performance standards.

FUELS AND POWERTRAIN LUBRICANTS LABORATORY performs development, evaluation, and environmental compliance assessments of fuels, alternative fuels, and powertrain lubricants (i.e., engine oils, gear lubricants, and transmission fluids) to enable introduction of new technologies and development of new performance standards.

TARDEC FUELS AND LUBRICANTS RESEARCH FACILITY (SWRI) a Government owned, contractor operated facility at the Southwest Research Institute, is a one-of-a-kind resource where integrated fuels-lubricants-engine systems research and development programs can be performed involving combustion, performance characterization, engine cleanliness, vulnerability assessments, and tribology can be performed.

EQUIPMENT/FACILITIES (continued)

OTHER facilities and equipment include: software engineering, signature, dynamic motion simulator (seat simulator), fabrication, computer-aided design, Laminate Object Manufacturing (LOM) rapid prototyping system, packaging engineering, model shop, metallurgical, mechanical test, animation capabilities used in support of virtual prototyping, rapid prototyping, visualization capabilities, sheet/metal welding, machine shop, assembly shop, electrical, battery test, instrumentation, IR imaging, thermal wave microscopy, applied engineering, scanning electronic microscope, and material spectrum analyzer.

Tank-Automotive Research, Development & Engineering Center

Warren, MI 48397-5000

Commander: MG Roy Beauchamp

(810) 574-5663

Director: Jerry L. Chapin

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.930	NA	NA	0.930
6.1 Other	1.359	0.000	3.989	5.348
6.2	15.187	5.180	26.403	46.770
6.3	1.071	10.802	17.478	29.351
Subtotal (S&T)	18.547	15.982	47.870	82.399
6.4	2.315	1.557	2.086	5.958
6.5	2.890	0.079	0.309	3.278
6.6	3.326	0.000	9.719	13.045
6.7	1.979	0.000	1.932	3.911
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	29.057	17.618	61.916	108.591
Procurement	18.543	NA	3.442	21.985
Operations & Maintenance	18.247	NA	24.485	42.732
Other	18.809	NA	7.362	26.171
TOTAL FUNDING	84.656	17.618	97.205	199.479

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

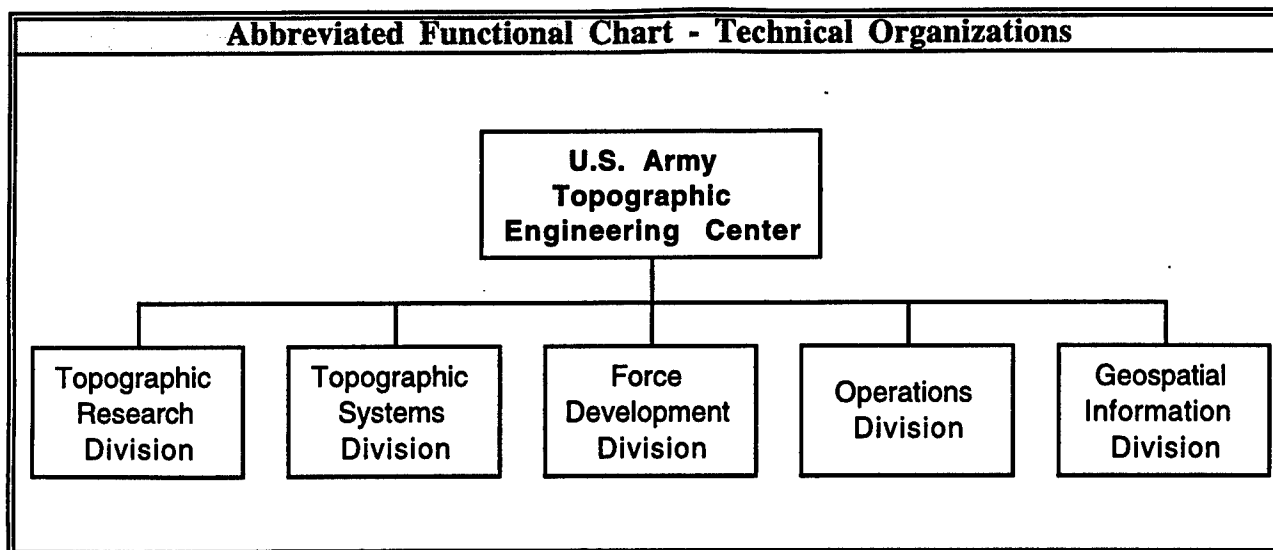
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	4	8	12
CIVILIAN	24	681	451	1,156
TOTAL	24	685	459	1,168

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	498.949	REAL PROPERTY	123.900
ADMIN	174.870	* NEW CAPITAL EQUIPMENT	2.000
OTHER	22.202	EQUIPMENT	229.733
TOTAL	696.021	* NEW SCIENTIFIC & ENG. EQUIP.	0.855
ACRES	85	* Subset of previous category.	

NA = Not Applicable

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Topographic Engineering Center



Topographic Engineering Center
Alexandria, VA 22315-3864
(703) 428-6654

Acting Director: William E. Roper
Commander: COL Robert F. Kirby

MISSION

The U.S. Army Topographic Engineering Center (TEC) is a field operating activity under the command of the U. S. Army Corps of Engineers (USACE). TEC's mission is to provide America's soldiers and their commanders with superior knowledge of the battlefield and to support the nation's civil and environmental initiatives through research, development and the application of expertise in topographic and related sciences. The mission involves research and development (R&D), system acquisition, operations and maintenance (OMA), and civil works programs. Military and civil R&D programs are guided by the USACE Director of Research and Development. System development programs are directed by the Program Executive Officer Command Control Communications Systems (PEO C3S), Program Executive Officer Intelligence and Electronic Warfare (PEO IEW), Deputy Chief of Staff, Operations (DSCOPS), and other agencies. Operations and Maintenance, Army (OMA) programs are under the guidance of the Deputy Chief of Staff for Intelligence (DCSINT) and the Office of the Chief of Engineers - Pentagon. The Engineer Strategic Studies Center (ESSC), under the operational control of the Deputy Chief of Engineers, serves as the Chief of Engineers' center of creative, innovative, analytical thought.

Vision: The preferred provider of quality geospatial research, development, products, and services.

CURRENT IMPORTANT PROGRAMS

Military and civil R&D efforts make extensive use of remote sensing technologies and geospatial data generation and portrayal. Research and development areas include: rapid generation of geospatial data; terrain analysis and characterization; passive and active spectral signature identification; photogrammetry; terrain visualization; battlefield and terrain related simulation and modeling; precision surveying and mapping; image analysis; data management; geographic information systems; and data/image fusion. As USACE's Center of Expertise in surveying and mapping, TEC provides support to Corps of Engineer headquarters, divisions, and districts, as well as other civil agencies, to ensure consistency of surveying and mapping products, to maintain the capability to manage complex, nation-wide survey systems, and to allow for the expert data analysis. TEC also has skills in systems engineering, acquisition management, sustainment, and support. TEC provides developmental and demonstration support to PM, Joint Precision Strike, developmental support to the Army Space Programs Office and PEOC3S for the Combat Terrain Information Systems.

Operationally, TEC serves as the Army's primary agent for terrain analysis and the Department of Defense's (DoD) primary agent for water detection. Support for contingency plans, military operations, and operations other than war is provided to terrain teams, DoD, DA staff, MACOMs, and joint commands. TEC serves as the Army's technical expert to combat and materiel developers and field topographic units and other users of geospatial information. TEC provides technical leadership for the orderly, cost effective integration of digital terrain data into Army systems and activities, and advises the Department of the Army Headquarters on all technical aspects of geospatial information requirements and standards.

CURRENT IMPORTANT PROGRAMS (continued)

TEC Technology Transfer in FY97: Completed two Construction Productivity Advanced Research (CPAR) Cooperative Research and Development Agreements (CRADAs). Titles and partners were Construction Vehicle Navigation and Automation with Caterpillar, Inc., and Advanced Hydrographic Surveying and Dredging System with Coastal Oceanographics, Inc. Initiated one new CRADA with ERDAS Inc. The purpose was to integrate DrawLand, the TEC-developed 3-dimensional terrain visualization software program, into a commercially available software product of ERDAS; investigated and coordinated nine new Technology Transfer opportunities with the private sector; initiated TEC's first annual Technology Transfer training for engineers and scientists in May 1997. Topic areas included terminology, concepts, responsibilities, statutory and regulatory basis, process, intellectual property, and current TEC Technology Transfer agreements; nominated two TEC engineers for the prestigious Federal Laboratory Consortium (FLC) 1997 Awards for Excellence in Technology Transfer; and provided a member for the FLC Training and the FLC Mid-Atlantic Region Nominating Committees. The FLC is composed of over 600 Federal laboratories and technical facilities. The FLC Mid-Atlantic region is composed of approximately ninety organizations in the states of Virginia, Maryland, Delaware, Pennsylvania, and West Virginia.

EQUIPMENT/FACILITIES

TEC facilities include: the Space Research Test Bed (SRTB); the Synthetic Environments Evaluation and Demonstration Site (SEEDS); the Virtual Laboratory; the Integration and Evaluation Center (IEC); the Spectral Research Facility; the Global Positioning System (GPS) and Survey Engineering Laboratory; the Battlefield Visualization Test Bed; the Terrain Information Extraction System, (TIES); and the Collection Management Office (CMO). SRTB provides an imagery exploitation test bed to support TEC reimbursable, technology base R&D operational programs. The SEEDS facility provides hardware and software for the integration, text, evaluation, and demonstration of cutting-edge modeling and simulation geospatial technologies. The Virtual Laboratory links the national and tactical imagery intelligence and topographic communities to the CINCs and operational Army elements. The IEC provides access to forces worldwide through the use of Army Global Grid connectivity, dedicated T-1 and T-3 lines to key installations, Asynchronous Transfer Mode (ATM) access, and Deployable Very Small Aperture Terminal (VSAT) supporting wideband satellite communications for conducting large-scale warfighting experiments. The spectral research facility contains a Digital Multi-Spectral Video camera, and multiple spectral radiometers and fluorometers used in studying both passive and active phenomena in the visible, near infrared, and thermal electromagnetic regions. The GPS and Survey Engineering Laboratory contains eight (8) geodetic-quality GPS receivers, permanent differential GPS reference stations with broadcast capabilities, and conventional survey equipment. Equipment for precise survey and point positioning is deployable on short notice. The Battlefield Visualization Test Bed is an assemblage of high-speed computers and peripherals that uses various data sources and processing techniques to produce realistic images of terrain for battlefield scenarios. The TIES provides a capability for extracting up-to-date terrain data from remotely sensed images. The CMO provides TEC the capability to rapidly query status and order National Imagery in hardcopy or softcopy formats.

TEC's computer inventory includes many powerful independent work stations as well as personal computers for the majority of the workforce.

Topographic Engineering Center
Alexandria, VA 22315-3864
(703) 428-6654

Acting Director: William E. Roper
Commander: COL Robert F. Kirby

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.198	NA	NA	0.198
6.1 Other	1.823	0.043	0.272	2.138
6.2	5.940	0.810	4.559	11.309
6.3	0.951	3.011	19.299	23.261
Subtotal (S&T)	8.912	3.864	24.130	36.906
6.4	0.989	0.110	0.077	1.176
6.5	0.361	0.441	0.000	0.802
6.6	4.567	0.000	0.500	5.067
6.7	0.720	0.015	0.316	1.051
Non-DOD	0.350	0.007	0.182	0.539
TOTAL RDT&E	15.899	4.437	25.205	45.541
Procurement	1.297	NA	0.000	1.297
Operations & Maintenance	12.102	NA	4.534	16.636
Other	3.619	NA	0.330	3.949
TOTAL FUNDING	32.917	4.437	30.069	67.423

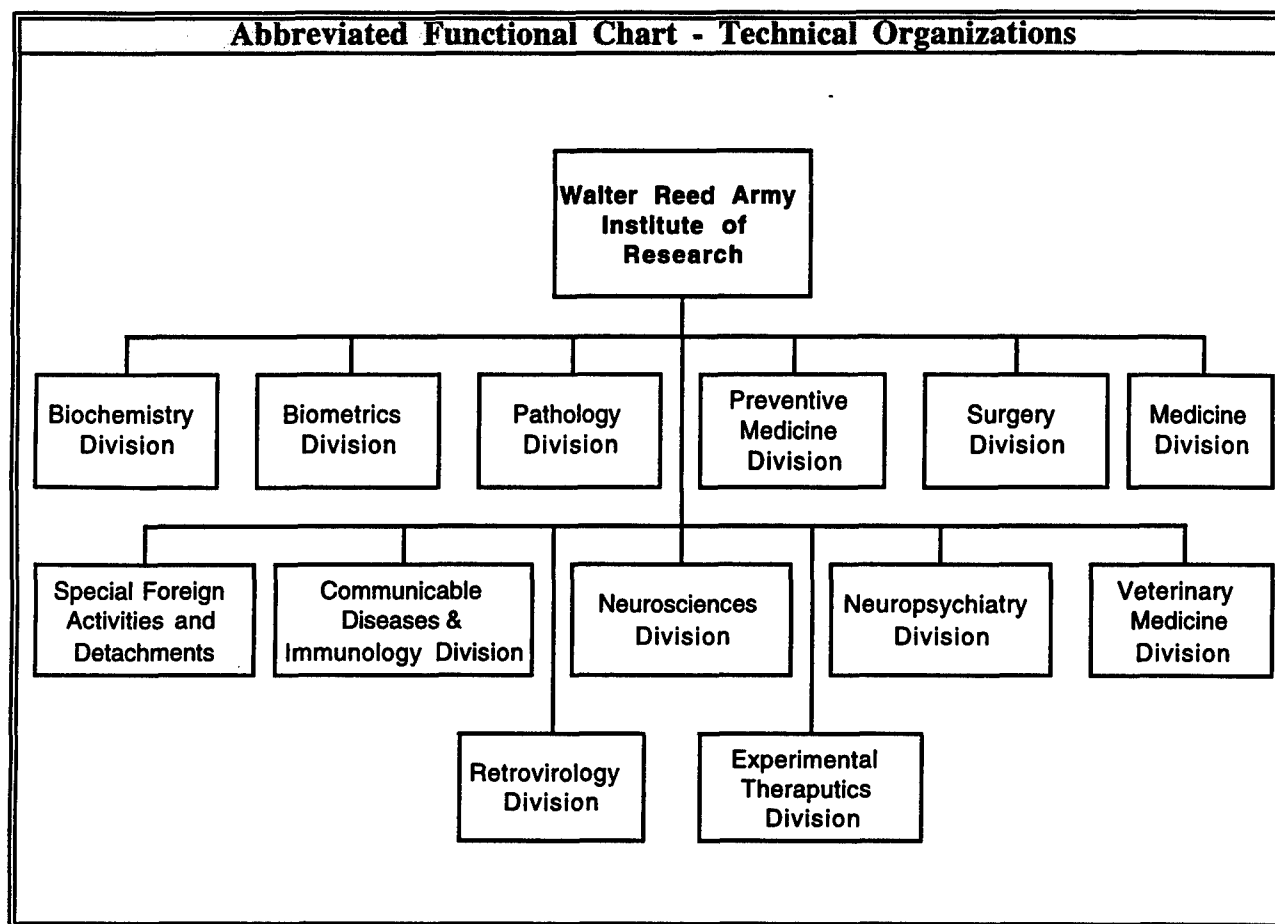
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.238

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	2	5	7
CIVILIAN	11	201	164	376
TOTAL	11	203	169	383

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	88.776	REAL PROPERTY	22.400
ADMIN	35.081	* NEW CAPITAL EQUIPMENT	0.000
OTHER	53.134	EQUIPMENT	23.521
TOTAL	176.991	* NEW SCIENTIFIC & ENG. EQUIP.	2.102
ACRES	0	* Subset of previous category.	

NA = Not Applicable

Walter Reed Army Institute of Research



Walter Reed Army Institute of Research
Washington, DC 20307-5100
(202) 782-3551

Director: COL Martin H. Crumrine
Deputy Director: COL Daniel L. Jarboe

MISSION

The Walter Reed Army Institute of Research (WRAIR) has one primary mission: biomedical research focused on soldier health and readiness. Whether in full scale war or in other operations, the WRAIR provides America's fighting men and women with the tools and knowledge to survive in hostile, disease-ridden, and health-threatening environments. The Institute fulfills its mission by conducting innovative research in naturally occurring infectious diseases, combat casualty care, operational health hazards, and medical defense against chemical and biological weapons.

CURRENT IMPORTANT PROGRAMS

Conduct research and develop drugs and vaccines to protect against infectious diseases to deployed soldiers. Conduct research and develop means to prevent operational stress in the combat environment. Conduct research and develop technologies for far forward combat casualty care and evacuation. Conduct research and develop strategies and technologies to prevent injuries from blast and directed energy sources and prevent progressive damage following traumatic wounds. Conduct research to develop medical strategies for the protection of soldiers from chemical and biological warfare threats. Evaluation of military health hazards of Army weapon systems and manpower programs, in coordination with AMC, TRADOC, and ODSCPER. Transfer military medical science and technology into commercially viable products through cooperative research and development agreements, (CRADAS) outreach programs, and patent licensing, such as CRADAS with commercial companies on the development of drugs and vaccines to prevent malaria.

There are approximately 21 persons assigned to WRAIR under CRADAs.

EQUIPMENT/FACILITIES

Complete analytical chemistry capability to include gas chromatography and mass spectrometry; drug development from computer-aided drug design and synthesis to field testing for efficacy and safety; vaccine development from basic research and computer assisted recognition of relevant vaccine candidates to biological model development and production, testing and production, testing and licensing; complete infectious disease diagnosis to include isolation and culture of causative agents and physiological, serological and genetic diagnosis; perform comprehensive human behavioral research studies both in the laboratory setting and in the field; evaluate health hazards from blast, toxic, gas, and laser energy as well as materiel, and approaches to combat casualties from these same sources; perform complete epidemiology on military medical threats and accidents from infectious diseases and toxins; through pathological evaluation to include histopathological diagnosis and transmission and scanning electron microscopy studies; basic research studies into the pathophysiology of disease utilizing modern cell physiology and hematological techniques; testing of drugs, vaccines and medical doctrine in overseas locations in Brazil, Germany, Thailand and Kenya.

EQUIPMENT/FACILITIES (continued)**Facility Locations:****A. WRAMC AND FOREST GLEN**

Headquarters and site of main research programs. The full spectrum of biomedical research is conducted to include: infectious disease and vaccine development research, HIV research, operational medicine, combat casualty care, and medical and chemical biological defense research.

B. CONUS DETACHMENTS

Wright Patterson Air Force Base - Occupational toxicology research.

Brooks Air Force Base - Medical effect of laser and microwave irradiation.

Blood Storage Preservation Research - located in leased space in Rockville.

Dental Research Detachment - Great Lakes, IL (Naval Base).

C. OCONUS DETACHMENTS

US Army Medical Research Unit (USAMRU) - Germany - Operational Stress and Human Dimensions Research related to Operational Medicine.

USAMRU - Kenya - Infectious diseases endemic to Sub-Saharan Africa.

USAMRU - Brazil - Infectious diseases endemic to South America including malaria, leishmaniasis, dengue, shigella, and enteric diseases.

Armed Forces Research Institute of Medical Sciences (AFRIMS) - Bangkok Thailand - Infectious diseases and vaccine development for those diseases endemic to Southeast Asia to include malaria and HIV.

Walter Reed Army Institute of Research
 Washington, DC 20307-5100
 (202) 782-3551

Director: COL Martin H. Crumrine
 Deputy Director: COL Daniel L. Jarboe

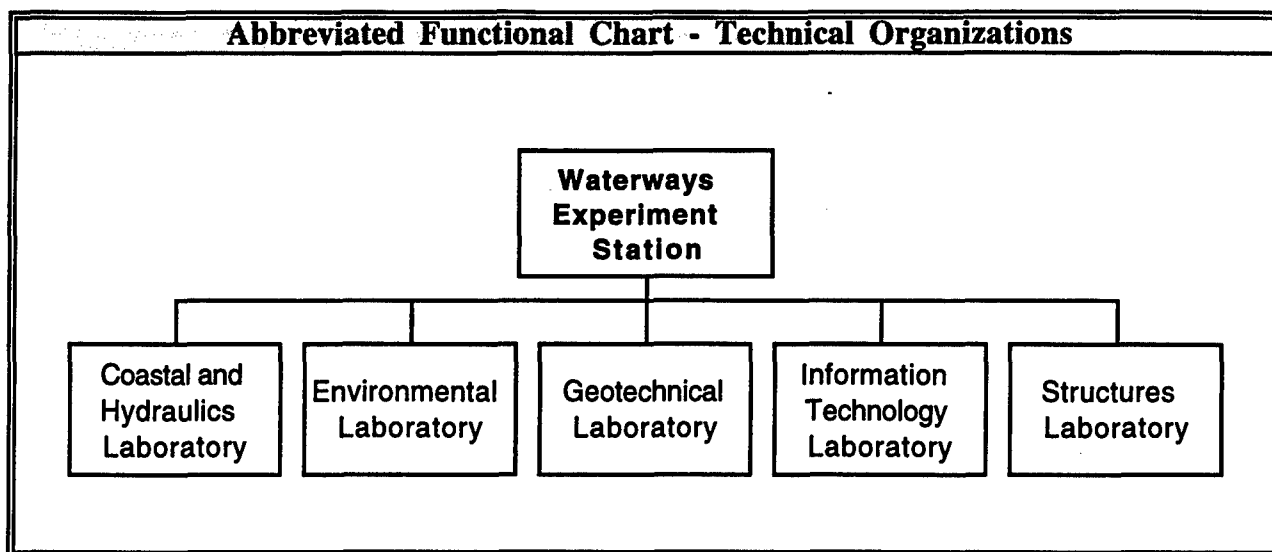
FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	2.319	NA	NA	2.319
6.1 Other	11.105	0.000	0.000	11.105
6.2	30.774	0.000	0.000	30.774
6.3	8.650	0.000	0.000	8.650
Subtotal (S&T)	52.848	0.000	0.000	52.848
6.4	1.510	0.000	0.000	1.510
6.5	0.245	0.000	0.000	0.245
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	54.603	0.000	0.000	54.603
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.000	NA	0.000	0.000
Other	7.502	NA	0.000	7.502
TOTAL FUNDING	62.105	0.000	0.000	62.105

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	52	100	192	344
CIVILIAN	76	87	240	403
TOTAL	128	187	432	747

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	403.544	REAL PROPERTY	16.460
ADMIN	178.372	* NEW CAPITAL EQUIPMENT	0.000
OTHER	151.472	EQUIPMENT	64.311
TOTAL	733.388	* NEW SCIENTIFIC & ENG. EQUIP.	2.572
ACRES	0	* Subset of previous category.	

NA = Not Applicable

Waterways Experiment Station

Waterways Experiment Station

Vicksburg, MS 39180-6199
(601) 634-2504

Director: Dr. Robert W. Whalin
Cdr & Dpty Dir: COL Robin R. Cababa

MISSION

The US Army Engineer Waterways Experiment Station (WES) is the largest Civil Engineering/Environmental Quality R&D complex in the Nation and is the DoD Category 3 Reliance lead Laboratory in the Civil Engineering Areas of Airfields and Pavements, Survivability and Protective Structures, and Sustainment Engineering. WES is the DoD Reliance lead Laboratory in the Environmental Quality subarea for Installation Restoration. WES operates and maintains the first DoD High Performance Computing Major Shared Resource Center for the Director, Defense Research and Engineering. The Tri-Service Computer Aided Design Drafting and Geographic Information System Technology Center is managed, operated and maintained by WES. The Corps of Engineers Central Processing Center is operated and maintained for the purpose of processing management information systems information for about 60% of Corps offices worldwide. WES manages 7 DoD Information Analysis Centers (IAC): Airfields, Pavements, and Mobility (IAC); Coastal Engineering (IAC); Concrete Technology (IAC); Hydraulic Engineering (IAC); Soil Mechanics (IAC); Environmental (IAC); and the Shock and Vibration (IAC). WES manages and executes 85% of the Army Corps of Engineers Civil Works Research and Development Program in the areas of hydraulic, coastal, geotechnical, structural, and environmental engineering, and information technology. Primary research and development missions encompass weapons effects; fighting positions; terrorist threat protection; structural hardening; fixed facility camouflage, concealment, and deception; vehicle/terrain interaction; military hydrology; lines of communications, construction, and repair; airfields and pavements; coastal engineering; coastal oceanography; littoral processes; hydraulic engineering; flood control and navigation; dynamic modeling and simulation; environmental impact; environmental restoration, aquatic plant control, zebra mussels, recreation, dredging and contaminated sediments; groundwater modeling; wetlands processes; environmental site characterization; ecosystem processes; reservoir, riverine, estuarine, and coastal water quality; mobility analyses; seismic response of structures; earthquake engineering; dredging and dredged material disposal; natural resources management; concrete technology; structural dynamics; and geotechnical engineering.

CURRENT IMPORTANT PROGRAMS

Unparalleled synergism exists between the \$111M US Army Civil Works R&D Programs (listed as Non-DoD under FUNDING DATA) and the other DoD RDTE. Construction materials and methods for rapid establishment of in-theater transportation network required for force protection; designs, materials, and construction practices for force protection (on the battlefield, from terrorist threats, and against advanced conventional weapons); engineer operations planning software for inclusion in the Army Tactical Command and Control System; accurate and reliable PC-based mobility models for command and control systems, combat models and simulations, and virtual prototyping; methodologies to predict coastal effects on Logistics-Over-The-Shore operations; Airfields and Pavements research for durable and cost-effective pavements for roads, airfields, and other operating surfaces including the development of design criteria for semi-prepared operating surfaces for the C-17 aircraft; effective remediation of sites contaminated with explosives, organics, and heavy metals; methods for investigation, characterization, and monitoring of potential hazardous waste sites; prediction of subsurface transport of contaminants in subsurface groundwater; effective chemical analysis techniques for accurate identification of suspected contaminants at DoD sites; Unparalleled synergism exists between the \$111M US Army Civil Works R&D Programs (listed as Non-DoD under FUNDING DATA) and the other DoD RDTE.

CURRENT IMPORTANT PROGRAMS (continued)

Construction materials and methods for rapid establishment of in-theater transportation network required for force protection; designs, materials, and construction practices for force protection (on the battlefield, from terrorist threats, and against advanced conventional weapons); engineer operations planning software for inclusion in the Army Tactical Command and Control System; accurate and reliable PC-based mobility models for command and control systems, combat models and simulations, and virtual prototyping; methodologies to predict coastal effects on Logistics-Over-The-Shore operations; Airfields and Pavements research for durable and cost-effective pavements for roads, airfields, and other operating surfaces including the development of design criteria for semi-prepared operating surfaces for the C-17 aircraft; effective remediation of sites contaminated with explosives, organics, and heavy metals; methods for investigation, characterization, and monitoring of potential hazardous waste sites; prediction of subsurface transport of contaminants in subsurface groundwater; effective chemical analysis techniques for accurate identification of suspected contaminants at DoD sites; Materials/Structural Engineering; Innovative Design and Construction; National Wetlands Characterization and Restoration; Zebra Mussel research; Repair, Evaluation, Maintenance, and Rehabilitation; Aquatic Plant Control research; Earthquake Engineering research, tunnel and underground facility detection research; and the Dredging Operations and Environmental Research Program. Technology Transfer Activities include: seventeen Cooperative Research and Development Agreements were approved, five Patent License Agreements were approved, and three additional patent license agreements were in negotiations.

EQUIPMENT/FACILITIES

The US Army Engineer Waterways Experiment Station (WES) has an unmatched combination of experimental and computational facilities for research in hydraulic, geotechnical, structural, environmental, and coastal engineering, and information technology. Some of the more significant facilities are:

Hazardous and Toxic Waste Research Center (HTWRC) (17,000 sq ft): This is the only DoD-permitted (RCRA) facility to conduct large volume HTW research, development, test, and evaluation. EPA recognizes the HTWRC as the Nation's premier facility.

Environmental Chemistry Laboratory: 8000 sq ft analytical laboratory supporting the of DoD environmental research, analytical, and quality assurance support for water quality, contaminated sediments, and environmental restoration facilities. This existing facility will be replaced in FY98 with a new 20,000 sq ft state-of-the-art facility in time to meet the expanded Corps environmental mission with demands for high hazard research (i.e. dioxins and dibenzofurans) at detection levels that meet requirements of health and regulatory risk-based hazard assessments.

Fate and Effects R&D Center (30,000 sq ft): Complete experimental radioisotope, microbiology, toxicity, and instrumentation laboratories for investigations of contaminant fate and effects on ecosystems.

DoD High Performance Computing Major Shared Resource Center (55,000 sq ft): Includes multiple, state-of-the-art High Performance Computing systems which provide the most powerful scientific and engineering capability in DoD with 47000+ MegaWords of memory, 1700 Gigabytes of high-speed disk, and 500 Terabytes of high-speed robotic archival storage. Includes a \$4.1M Scientific Visualization Center to identify and develop innovative methods of interpreting large data sets from modelings/simulation, field data collection, and Computer Aided Design and Drafting (CADD) applications.

EQUIPMENT/FACILITIES (continued)

Airfields & Pavements Research Center (25,000 sq ft): State-of-the-art facility contains the DoD unique Joint Sealant Laboratory and an Automated Data Acquisition System for acquiring rheological data on creep, strength, resilient moduli, and fatigue of a variety of paving materials.

Materials Testing Center: Full-service, state-of-the-art laboratory for conventional and specialized soil, rock, concrete, asphalt, and aggregate testing.

Soils Research Center (10,000 sq ft): The largest soil mechanics research facility in DoD, it has a loading capability of 250,000-lb on triaxial specimens up to 15 inches in diameter. Also included are direct shear devices for 3 to 24 inch specimens, automated consolidometers and rock-testing capabilities including anchor pullout tests.

Mass Construction Materials Laboratory (20,000 sq ft): A concrete research and development laboratory for determining physical, chemical, and mineralogical properties of concrete and other construction materials as well as the structural response of subscale models.

Full-Scale Aircraft Loading Facility: Simulates aircraft loading with different wheel loads and gear geometry applied to full scale constructed test pavements; response and performance data for development of new design and behavior theories; current fighter and transport aircraft simulators.

Projectile Penetration Facility: Unique to DoD, this facility enables investigation of anti-penetration shielding technology techniques employing geologic and manmade structural materials against a wide variety of threats. An 83-mm diameter gas gun has the capability of launching projectiles with masses up to 2.8kg at velocities in excess of 2km/sec and launching projectiles with masses of 12kg at velocities of 1km/sec.

Coastal Facilities: Approximately 400,000 sq ft under roof for 3-D high-precision coastal experiments. Contains over 850-ft of spectral wave generators (including a 90-ft long Directional Spectral Wave Generator) designed to reproduce waves of 2-ft in height.

Field Research Facility, Duck, NC (175 acres): Recognized worldwide for cooperative multi-national and multi-agency high precision field experiments in coastal and nearshore processes; 1970-ft concrete and steel pier, 1 mile of beachfront, full suite of installed coastal processes instrumentation, special purpose beach and amphibious vehicles, etc.

RipRap Experimental Facility: The largest curved channel experimental facility in the world, used for study of effects of channel bendways on flow fields, specifically aimed at developing design criteria for riprap protection of bendways.

Hydraulic Engineering Experimental Facilities: Approximately 2,500,000 sq ft under roof for high-precision experiments relating to rivers, estuaries, hydraulic structures, and navigation.

Mobility Instrumentation Facility: 30,000 sq ft complex for conducting research and development investigations of cross-country mobility, trafficability, and terrain data acquisition. This research requires complex design and fabrication of real-time data collection and analysis hardware unique to quantifying the performance of all types of wheeled, tracked, and amphibious military vehicles. A 14,000 sq ft annex is optimally structured to support modeling and simulation in distributive interactive simulations and virtual prototyping in support of battlefield automation.

Aquatic and Wetlands Ecosystem Research Center: 10,000 sq ft research center provides the capability to evaluate the impact of DoD activities on aquatic and wetland ecosystems, including impacts on threatened and endangered species, and wetland identification, delineation, and evaluation.

EQUIPMENT/FACILITIES (continued)

Geophysics Research, Applications, and Test Facility: the most extensive near-surface geophysics equipment and applications capability in DoD. Specializing in engineering, environmental, archeological, and groundwater geophysics, the facilities support the DoD requirements for foundation investigations, installation restoration, cultural resource assessments, military groundwater supply, tunnel detection, and environmental site characterization. In addition, a 15,000 sq ft Engineering Geophysics Training Facility consisting of metallic and non-metallic targets buried at various depths and orientations, is used for evaluating geophysical instruments and providing hands-on training with the equipment.

Centrifuge Research Center: Uniquely large and powerful, the research centrifuge weighs 85 tons and has a 21-ft radius; it can apply a maximum g-force of 1256 g-tons operating at 350g's for a 2.2 ton payload and at 143g's for an 8.8 ton payload (1g = normal gravity). A 27.5-year event can be replicated in one day operating at 350g's. Research applications include all areas of civil and environmental engineering with particular focus on earthquake engineering, coastal engineering, structural engineering, blast phenomena, and groundwater behavior. Under Secretary of the Army, the Honorable Robert M. Walker, represented the Secretary of the Army and was the keynote speaker at the dedication of the Centrifuge Research Center on 20 November 1997.

Mobile Ballistic Research System: provides the DoD with the capability to conduct projectile penetration field experiments at geologic sites of interest. The truck-mounted, breach-loaded ballistic gun can launch large-scale (up to 155-mm) projectiles at velocities as high as 1km/sec. Associated diagnostic instrumentation and analysis hardware are contained within a support trailer.

Geodynamics Research Facility: unique to DoD, this facility houses a wide variety of high-pressure dynamic devices that simulate explosive loadings under controlled stress states on geologic and man-made construction materials. The characterization of their material behavior is required for weapons effects assessment against military fixed assets.

Waterways Experiment Station
Vicksburg, MS 39180-6199
(601) 634-2504

Director: Dr. Robert W. Whalin
Cdr & Dpty Dir: COL Robin R. Cababa

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.249	NA	NA	0.249
6.1 Other	2.233	0.036	0.928	3.197
6.2	52.576	0.655	44.107	97.338
6.3	5.560	0.016	5.821	11.397
Subtotal (S&T)	60.618	0.707	50.856	112.181
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	5.128	0.000	0.259	5.387
6.7	0.000	0.000	0.000	0.000
Non-DOD	83.629	1.162	26.488	111.279
TOTAL RDT&E	149.375	1.869	77.603	228.847
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	1.507	NA	28.173	29.680
Other	0.433	NA	0.307	0.740
TOTAL FUNDING	151.315	1.869	106.083	259.267

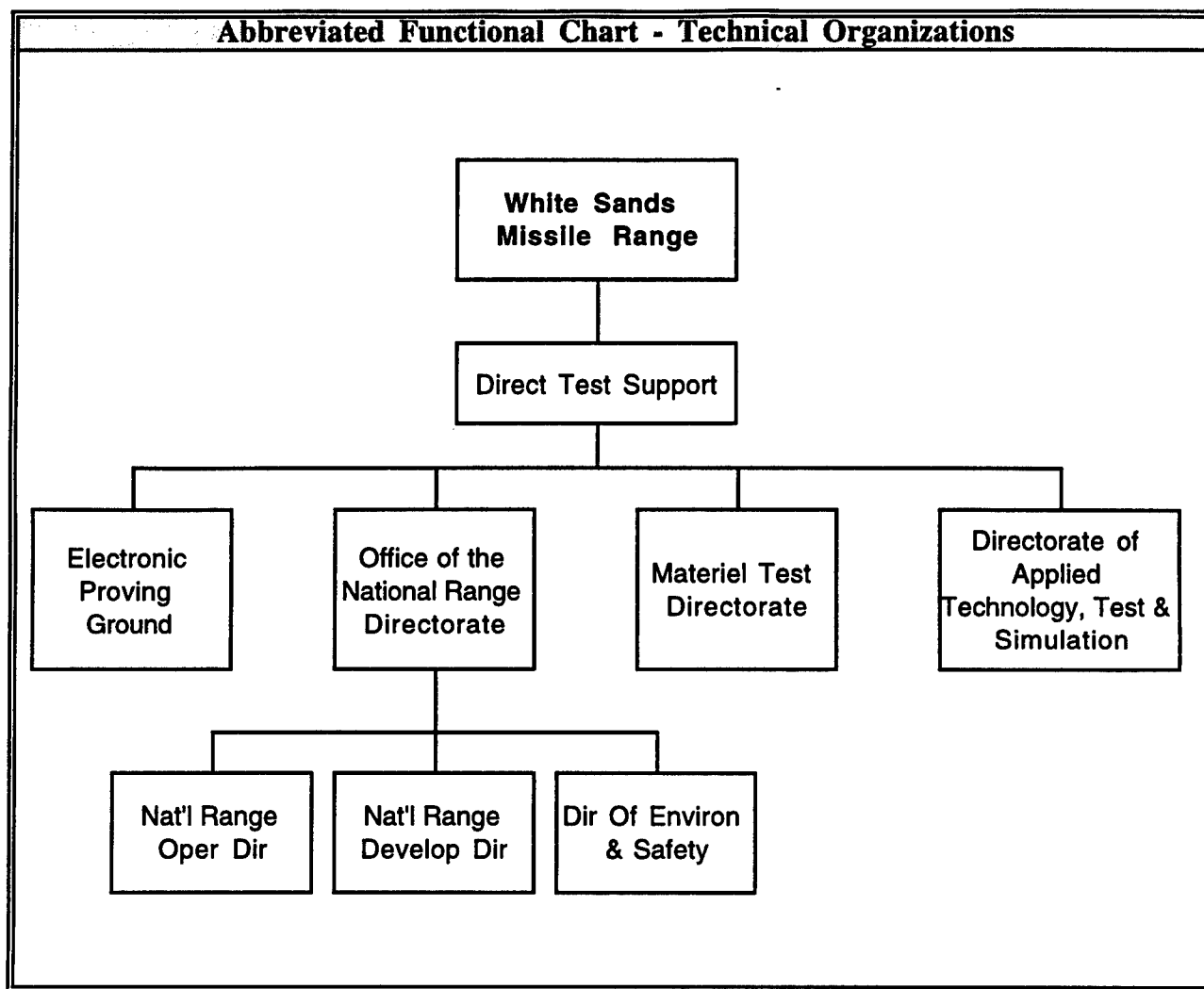
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.455

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	4	0	4
CIVILIAN	183	466	609	1,258
TOTAL	183	470	609	1,262

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	2,555.940	REAL PROPERTY	493.295
ADMIN	234.240	* NEW CAPITAL EQUIPMENT	7.215
OTHER	48.330	EQUIPMENT	565.042
TOTAL	2,838.510	* NEW SCIENTIFIC & ENG. EQUIP.	35.807
ACRES	2,812	* Subset of previous category.	

NA = Not Applicable

White Sands Missile Range



White Sands Missile Range
White Sands Missile, NM 88002-5000
(505) 678-7900

Commander: BG Jerry L. Laws
Technical Dir.: George A. Orlicki

MISSION

WSMR's mission is to provide quality management and operation of the premiere MRTFB with a unique combination of real estate, airspace, instrumentation, laboratories, launch facilities, and technical expertise, to support the RDT&E requirements of the Tri-Services, DoD agencies, other government agencies, commercial entities and foreign governments. Due to the large land mass and controlled airspace, WSMR supports a variety of combat training activities. To support advanced weapons testing, WSMR is a key resource for development of state-of-the-art instrumentation, not only for WSMR, but for the entire MRTFB community. WSMR supports the full range of Command, Control, Communications, and Intelligence (C4I) systems, electromagnetic effects and nuclear environments testing. C4I testing is conducted by WSMR/Electronic Proving Ground (EPG) located at Fort Huachuca, AZ and Fort Lewis, WA. We challenge, enrich, and develop our most precious asset, our human resources, while continuing to improve productivity and quality of life.

CURRENT IMPORTANT PROGRAMS

Army-Patriot, Army Tactical Missile System (ATACMS), Theater High Altitude Area Defense (THAAD), Advanced Medium Range Air-to-Air Missile (AMRAAM), Standard Missile (SM), Multiple Launch Rocket System (MLRS), Theater Missile Defense Programs (TMDP), Research Rockets, Advanced Short Range Air-to-Air Missile (ASRAAM), Extended Sea Sparrow Missile (ESSM), Space Shuttle, and Tactical Training Program. Unmanned Aerial Vehicle, Army Tactical Command and Control System, Enhanced Position Location Reporting Systems, Global Positioning System, All Source Analysis System, Single Channel Ground and Airborne Radio Systems, Intel and Electronic Warfare, Counter Technology Assessment Center Support to Office of National Drug Control Policy (Cactus Wren), Advanced Warfighting Experiments, Satellite Test Bed, and Digitization of the Army.

EQUIPMENT/FACILITIES

White Sands Missile Range, including the Electronic Proving Ground, Fort Huachuca, Az., has a variety of equipment, facilities and features that make it a premier test range. These features include: the largest overland test range, WSMR managed restricted airspace and varied terrain features. WSMR also has range instrumentation which includes the Multiple Object Tracking Radar (MOTR), Air Surveillance System, Miss Distance Indicating (MIDI) Radar, WEIBEL Radar, Remote Control Optical Tracking Mounts, Global Positioning System (GPS) and Telemetry and Radar Instrumentation. WSMR has a complete environmental and scientific laboratory suite (including a Microbiological Test Chamber, Large Environmental Test Chamber, Chemistry Lab, Metallurgy Lab, and Dynamics Lab) and Nuclear Effects Testing Facilities such as the Solar Furnace, Electromagnetic Pulse, Linear Electron Accelerator, Electro-magnetic Radiation Effects transmitters and the Large Blast Thermal Simulator. Big Crow is an airborne electronic warfare asset that includes and aircraft and helicopters. WSMR is also the site of the Aerial Cable Range, a three mile cable suspended from two mountain peaks. The Smart Munitions Test Suite allows us to track submunitions. At our Electronic Proving Ground site we operate the Electromagnetic Environment Test Facility using computer modeling/simulation, C4I, hardware-in-the-loop and controlled field test environment. We also operate the System Interoperability Computer Software Test Facility, the Realistic Battlefield Frequency Measurement Environment Facility, the EMI/EMC/Tempest Transverse Electromagnetic/Reverberation Chamber and operate the Antenna Test Measurement Facility. EPG has a 12,000 foot paved runway and numerous paved and unpaved UAV runways. EPG is also the site of the only beacon testing facility in the United States licensed to test and approve for certification commercial emergency rescue beacons.

White Sands Missile Range
White Sands Missile, NM 88002-5000
(505) 678-7900

Commander: BG Jerry L. Laws
Technical Dir.: George A. Orlicki

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.710	0.000	0.219	0.929
6.3	3.782	0.000	2.405	6.187
Subtotal (S&T)	4.492	0.000	2.624	7.116
6.4	4.970	0.000	4.119	9.089
6.5	157.861	0.000	30.692	188.553
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	24.813	0.000	46.684	71.497
TOTAL RDT&E	192.136	0.000	84.119	276.255
Procurement	13.653	NA	2.561	16.214
Operations & Maintenance	5.535	NA	2.334	7.869
Other	2.798	NA	0.259	3.057
TOTAL FUNDING	214.122	0.000	89.273	303.395

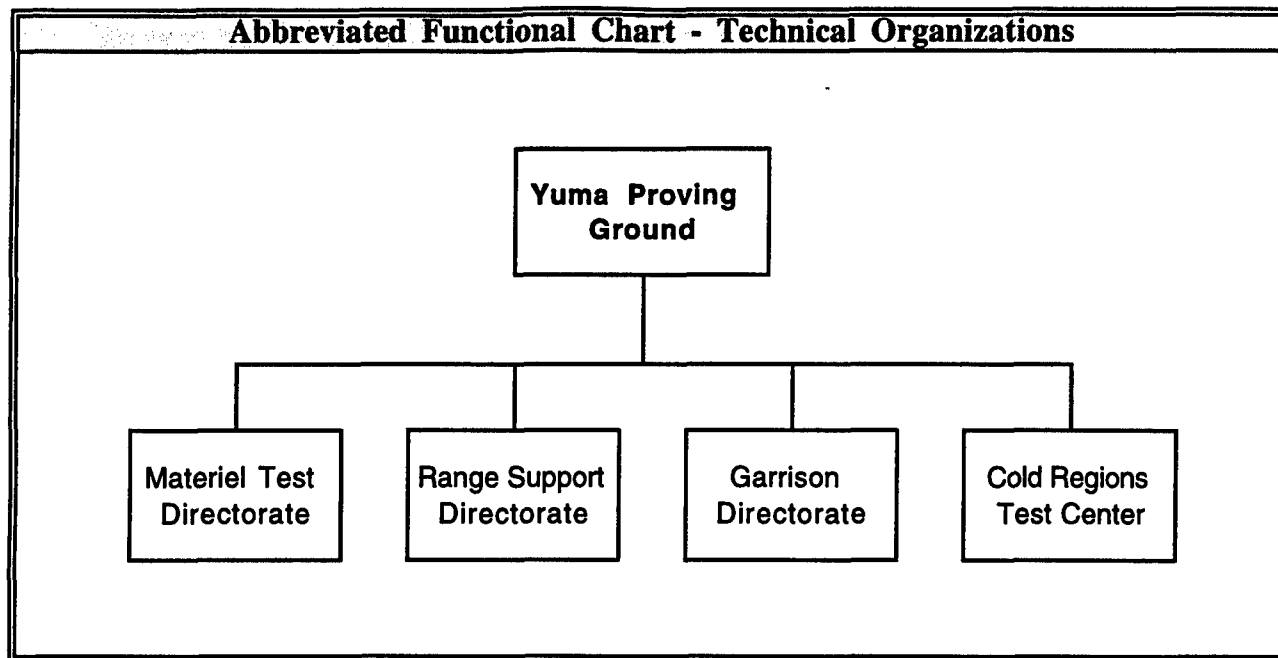
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	2	8	418	428
CIVILIAN	12	606	1,630	2,248
TOTAL	14	614	2,048	2,676

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,870.620	REAL PROPERTY	510.558
ADMIN	957.528	* NEW CAPITAL EQUIPMENT	0.000
OTHER	1,568.209	EQUIPMENT	532.033
TOTAL	4,396.357	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	2,311,129	* Subset of previous category.	

NA = Not Applicable

Yuma Proving Ground



Yuma Proving Ground
Yuma, AZ 85365-9101
(520) 328-2163

Commander: COL Robert C. Filbey
Technical Dir: James L. Wymer

MISSION

Plan, conduct, analyze and report the results of development and other tests of aircraft weapons, long-range artillery, military vehicles, armored vehicles, tank weapons, munitions of all types and aerial delivery systems (parachutes). YPG also conducts tests of military equipment in the natural desert terrain and environment. YPG has responsibility for natural environment testing at the Cold Regions Test Center (Alaska) and Tropic Test Site (Panama).

CURRENT IMPORTANT PROGRAMS

M1-A1 Abrams Tank.

M-2 Bradley IFV.

Palletized Load System (PLS).

Search and Destroy Armor (SADARM).

Tank Main Armament System (TMAS).

Liquid/Propellant Gun.

C-17 Cargo Aircraft.

Low Altitude Retrorocket Recovery System (LARRS).

OH-58D Kiowa Warrior.

Unmanned Aerial Vehicle Close Range (UAV-CR).

RAH-66 Comanche Target Acquisition Systems.

AH-64D Apache Longbow.

Wide Area Mine (WAM).

SafeAir.

Cold Weather Clothing and Equipment.

EQUIPMENT/FACILITIES

WEAPONS FIRING CHAMBER: Capable of testing full-sized combat/tactical vehicles and helicopters, artillery and direct fire systems from -65F to 160F with humidity from 5% to 95%.

WEAPONS ACCURACY RANGE: The artillery range is sufficiently large to fire all artillery to maximum range and is fully instrumented with radar, multi-camera tracking mounts, telemetry and microwave systems, specially developed instrumented impact fields and communications systems. The aircraft weapons range is specially developed for helicopter armament and instrumented with multiple laser trackers, radars, telemetry video, multi-camera tracking mounts, remote control moving targets, GPS-based moving target tracking system and integrated real-time mission control and data processing center. The aircraft range includes specialty sites for ground mounted tests of aircraft weapons. All range areas are under restricted airspace to a minimum of 80,000 ft.

AUTOMOTIVE TEST COURSES: Paved, unpaved, hilly, Middle East, gravel, dust, fording basin, vehicle swimming, dynamometer capability for all Army systems. Complete shop and overhaul capability for Army vehicles and weapons systems.

AIR CARGO TEST FACILITY: Army airfield, two (2) runways to 6,000 ft., two (2) hangars, Air Cargo Complex for tests of airdrop systems and airdrop qualification of military systems and ammunition.

TEST ENVIRONMENT: Complete environment test capability including 30,000 lb. vibration tables, rain, humidity, dust and other chambers. Laboratory facilities including X-ray, chemical and materials lab.

NATURAL ENVIRONMENT: Cold weather, tropic and desert testing.

Yuma Proving Ground
Yuma, AZ 85365-9101
(520) 328-2163

Commander: COL Robert C. Filbey
Technical Dir: James L. Wymer

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	15.234	0.279	81.190	96.703
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	15.234	0.279	81.190	96.703
Procurement	2.026	NA	1.695	3.721
Operations & Maintenance	4.297	NA	4.287	8.584
Other	6.553	NA	3.336	9.889
TOTAL FUNDING	28.110	0.279	90.508	118.897

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	1.500

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	110	110
CIVILIAN	0	123	602	725
TOTAL	0	123	712	835

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	28.209	REAL PROPERTY	156.596
ADMIN	141.199	* NEW CAPITAL EQUIPMENT	28.700
OTHER	2,075.873	EQUIPMENT	228.655
TOTAL	2,245.281	* NEW SCIENTIFIC & ENG. EQUIP.	0.601
ACRES	1,009,403	* Subset of previous category.	

NA = Not Applicable

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DEPARTMENT OF THE NAVY



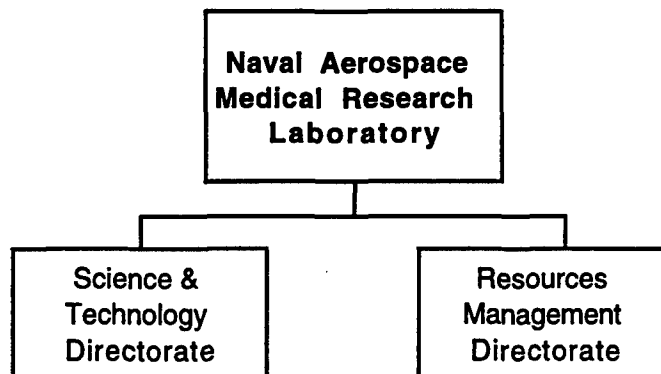
DEPARTMENT OF THE NAVY

The Navy's fifteen (15) In-House RDT&E Activities are:

Naval Aerospace Medical Research Laboratory	3-2
Naval Air Warfare Center	3-8
Navy Clothing and Textile Research Facility	3-22
Naval Command, Control and Ocean Surveillance Center	3-26
Naval Dental Research Institute	3-34
Naval Facilities Engineering Service Center	3-38
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Naval Medical Research Unit #2	3-56
Naval Medical Research Unit #3	3-62
Navy Personnel Research and Development Center	3-66
Naval Research Laboratory.....	3-70
Naval Submarine Medical Research Laboratory	3-82
Naval Surface Warfare Center	3-86
Naval Undersea Warfare Center.....	3-98

Naval Aerospace Medical Research Laboratory

Abbreviated Functional Chart - Technical Organizations



Naval Aerospace Medical Research Laboratory
Pensacola, FL 32508-1046
(850) 452-3286

CO: Captain L.H. Frank, MSC
Technical Director: Dr. Robert Stanny

MISSION

The laboratory's mission is to conduct research and development in aviation medicine and allied sciences to enhance the health, safety, and readiness of Navy and Marine Corps personnel.

CURRENT IMPORTANT PROGRAMS

ENHANCED HEARING PROTECTION FOR HIGH-NOISE ENVIRONMENTS: Current hearing protection devices can be inadequate in high-noise operational environments. We have developed and patented a new sound-attenuating technology that significantly improves hearing protection devices and sound attenuation in general. We are determining optimal engineering parameters for the new technology, applying them to hearing protectors and sound-attenuating materials, providing prototype models for formal test and evaluation, and developing design specifications for eventual manufacture.

NAVAL AVIATION PILOT PREDICTION SYSTEM: This project is (1) centralizing existing training and mishap data for naval aviators from accession through winging and beyond; (2) determining the feasibility of using training and fleet-performance criteria to identify marginal performers; (3) developing predictive models for selection, classification, and review/mishapboard analysis; and (4) developing a networked system for accessing the database and associated predictive models.

SPATIAL AWARENESS IN NAVAL AVIATION: We are developing tactile navigation and orientation displays that enhance spatial awareness and reduce operator workload. We have developed displays that pilots and special forces personnel can use to navigate and maintain situational and spatial awareness in the absence of visual information.

NAVAL AVIATION SELECTION TOOLS DEVELOPMENT: We have developed an Internet version of the Aviation Selection Test Battery (ASTB) that will improve the Navy/Marine Corps aviator selection process by reducing test administration and maintenance costs, enhancing test security, and providing new opportunities to develop and validate better test items. The paper-and-pencil ASTB is taken by approximately 10,000 examinees annually at over 200 remote sites around the world. This volume of remote testing makes the ASTB an ideal candidate for implementing in a client/server format.

LANDING CRAFT AIR CUSHION (LCAC) VEHICLE NAVIGATOR SELECTION SYSTEM: In the late 1980s, LCAC operators and engineers had training attrition rates as high as 40-60%. Consequently, the Naval Safety Center asked us to develop a selection system to reduce this rate. With funding from the Naval Air Systems Command, the revised LCAC selection system was delivered in 1992, and attrition rates dropped to 10-20%. Similar attrition problems among LCAC navigators led to an additional tasking to develop a selection system for this position. A task analysis was completed, and a selection system was developed and validated. Preliminary screening began in May 1996. The final system is in development; a full product will be delivered in October 1998.

ATTENTION-DIRECTING FLIGHT INSTRUMENT DISPLAY: All current flight instrument displays require pilots to scan instruments, one after another, and mentally integrate the data to produce flightpath information. We have developed a new technique that integrates flight information in a single display, thus permitting pilots to understand their positions in flight at a glance. The new display reduces time spent on instruments to approximately 15% of that required with traditional displays and almost eliminates routine scanning.

CURRENT IMPORTANT PROGRAMS (continued)

UNMANNED AERIAL VEHICLE (UAV) HUMAN FACTORS: The objective of this project is to characterize the cognitive skills needed to pilot UAVs, and to evaluate human-factors design and interface issues in UAV control systems, panels, and displays.

VISUAL SCANNING AS AN INDEX OF PILOT SKILL DEVELOPMENT: The objective of this project is to develop teaching aids that facilitate the acquisition of instrument-scan patterns by student pilots.

NIGHT VISION FOR SPECIAL WARFARE: We are developing a field-worthy, operationally relevant night vision test that: (1) has known and definable relations to tests in the optometric literature and (2) is predictive of operational performance under a variety of nighttime conditions.

VIRTUAL DISPLAYS IN ACCELERATION ENVIRONMENTS: This basic-research project is characterizing the effects of actual motion on spatial perception and the motor responses of human operators in virtual environments.

VESTIBULAR TEST DEVELOPMENT: The objective of this project is to improve aviation selection and training by developing tests that detect vestibular and other disorders of spatial orientation incompatible with military aviation.

SPATIAL ORIENTATION DESIGN AND TRAINING ISSUES: This project is aimed at improving cockpit design standards by defining relations between control compatibility, pilot spatial awareness, and pilot performance, as well as enhancing pilot performance by developing training programs that incorporate accurate models of sensory-spatial awareness.

APPROACHES TO SPATIAL DISORIENTATION: Our task is to develop basic knowledge and models of systems involved in the control of whole-body motion relative to the earth. Current models are insufficient to predict the perceptual and sensorimotor reactions that occur in complex motion conditions. The ultimate objective is to develop mathematical models that will predict spatial orientation dynamics in complex environments of flight simulators and real flight.

SOPITE SYNDROME: The term Sopite Syndrome was coined to describe the extreme fatigue and drowsiness that can occur in motion and virtual environments. The project entails characterizing basic neurophysiological and behavioral effects of the syndrome, developing fleet recommendations and guidelines, and relating the syndrome to similar maladies, such as Simulator Sickness and Space Adaptation Syndrome.

MARINE CORPS FIELD CASUALTY MONITORING/TRACKING SUPPORT: We are developing a flexible, user-friendly, information-management system for real-time correlation of tactical operations, patients, and echelons 1 through 4 evacuation and treatment resources. The system should improve medical regulating significantly on battlefields of the future.

HEALTH RISK APPRAISAL OF NAVAL SPECIAL FORCES PERSONNEL: The Department of the Navy lacks baseline epidemiological and health data needed to adequately assess and track the health status of naval Special Operations Forces (SOF) personnel. In this project, we are gathering baseline health and health risk factor data on active duty, reserve, and retired naval SOF personnel.

PERFORMANCE-BASED OCCUPATIONAL STRENGTH TESTING FOR CANDIDATE NAVY PILOTS/NAVAL FLIGHT OFFICERS: Goals of this project are threefold: (1) to identify selected strength-critical tasks in the Joint Primary Aircraft Trainer System (JPATS), (2) to replicate those tasks on a strength screening device, and (3) to develop strength enhancement programs that will enable individuals to meet or exceed the strength standards (control force requirements) specified in the JPATS MIL-SPECs.

EQUIPMENT/FACILITIES

The **VISION LABORATORY** includes a mobile night vision device (NVD) training facility ('NITE Lab') that can be used to train NVD users in the field. The 'NITE Lab' is equipped with numerous NVD demonstrations and training aids as well as optical testing and vision equipment. The laboratory has facilities for recording, digitizing, and mathematically filtering and enhancing visual images. In cooperation with the helicopter training facility at Whiting Field (TRAWING FIVE), the laboratory is able to noninvasively record the instrument scan patterns of pilots flying the motionbased, full-scale helicopter instrument trainer.

The **SPATIAL DISORIENTATION LABORATORY** capability is a unique national asset consisting of many one-of-a-kind research devices.

The **CORIOLIS ACCELERATION PLATFORM (CAP)** is the only device worldwide capable of applying combined linear and angular acceleration to the human subject. It is also the only device in the DOD inventory available to study chronic exposure to altered G environments. It uses two, independently controlled power servomechanism drive systems to generate acceleration stimuli caused by rotation about an Earth-vertical axis and/or rectilinear translation along an Earth-horizontal axis. This device has enabled scientists to make accurate simulations of many bizarre combinations of force stimuli and their effects on aerospace crewmen under carefully controlled conditions. Data gathered in various studies using the CAP continue to contribute significantly to the success of the space program and to the safety and well being of astronauts.

The **HUMAN DISORIENTATION DEVICE (HDD)** can accelerate an instrumented human subject about two head-centered axes simultaneously. It is used to help differentiate the relative roles played by the various sensory systems involved in the production of disorientation, as well as to examine the contribution of each system and subsystem to motion sickness. The HDD is also employed to study the effects of disorientation caused by rotation and tumbling. The HDD differs substantially from the Pate device in that the axes of rotation can be made to pass through the intersection of the interaural and naso-occipital lines. This permits isolating the function and stimulation of specific portions of the organs of balance in the inner ear. The device has provided direct support for many basic and applied research projects sponsored by both the Navy and NASA.

The **LINEAR ANGULAR ROTATOR (LAR)** is a new, short-arm (6-foot), human centrifuge capable of high rotation speeds (to 80 rpm) and precise, simultaneous, linear movement of the human along the arm. It is located in a large, cylindrical chamber upon which visual stimuli can be projected. The LAR and chamber combination will permit displaying visual stimuli at various distances from the center of rotation, to about 25 feet from the subject. Due to its ability to produce accurate linear and rotational stimuli, the LAR will afford precise measurements of unilateral labyrinthine function, which should lead to improved clinical tests for detecting vestibular abnormalities. Because the device will afford linear and rotational stimuli coupled with near and distant visual stimuli, it will enable studies of visual suppression of vestibulo-ocular reflexes, and of visual information processing under conditions in which target and background stimuli vary in distance and move at different speeds.

The **VESTIBULAR VISUAL SPHERE DEVICE (VVSD)** is a new device for studying visual-vestibular interactions. The VVSD is a 12-foot sphere that can be rotated about two axes to approximately 29 RPM. A subject seated in the center of the sphere can rotated about two axes to approximately 57 RPM. Visual stimuli displayed on the interior of the sphere yield compelling, visually induced motion illusions. The VVSD permits displaying real, moving stimuli to stationary or moving subjects. Measurements of three-dimensional, visual-vestibular responses should provide gold-standard data for evaluating virtual-reality displays, and for evaluating the effects of these displays on stationary and moving observers. The device will also permit exploring conditions in which the visual suppression of vestibulo-ocular reflexes (hence the ability to track visual targets) is enhanced relative to normal. Findings from these studies should lead to techniques for optimizing information delivery through head mounted displays.

EQUIPMENT/FACILITIES (continued)

The **PENDULAR INERTIAL GRAVITATIONAL (PIG)** devices (PIG 1A and PIG 1B) are fixed on the CAP linear track and are used to position a human subject at various angles off vertical axis while the CAP room is rotated. The PIGs can be oriented in four different directions.

The **EQUITEST SYSTEM** employs computerized dynamic posturography to systematically examine the effectiveness of visual, vestibular, and somatosensory inputs to balance and the timing, strength, and coordination of postural movements. This permits evaluating visual, vestibular, and somatosensory contributions to equilibrium.

The **PATE DEVICE** resembles a patient litter and is capable of rotating a subject about the longitudinal body axis and/or the horizontal axis through the pelvis. This apparatus has slip rings, which permit physiological monitoring, and is currently being used to study eye movements in response to rotation or perceived motion generated by moving patterns projected on a hemispheric screen in front of the subject.

The **OCULAR COUNTERROLL DEVICE** is used to measure ocular counterroll in response to total body tilting movement and provide information on possible changes related to aging.

The **OFF-VERTICAL-ROTATOR (OVR)** is used to gain measures of semicircular canal and otolith function and related spatial orientation performance.

The **PERIODIC ANGULAR ROTATOR (PAR)** is a novel servomotor designed for studies of the dynamic response of the vestibulo-ocular system. The PAR is a high-performance motion-inducing instrument that rotates a seated subject about the Earth-vertical axis in a wide variety of stimulus waveforms.

The **PSYCHOACOUSTICS LABORATORY** includes acoustical test chambers, an ANSI standards compliant Real-Ear Attenuation Test Facility, a semireverberant test chamber for simulating various Navy operational environments, and a high-level noise test chamber. In addition, equipment is available to support analog and digital signal processing, speech analysis, spectral analysis, and radio voice communications monitoring. The psychacoustics laboratory also houses unique equipment for the design, fabrication, and testing of innovative hearing protection devices and sound attenuating materials.

We have three **ENVIRONMENTAL CHAMBERS**, two of which are in adjacent rooms. One is 8 x 8 ft; the other is 10 x 16 ft. The smaller chamber, used primarily for cold exposure, has active temperature control from -5 to 25 degrees C. The larger room has active temperature control from 0 to 50 degrees C. The third environmental chamber is a free-standing room 8 x 10 ft with precise temperature (0-60 degrees C) and humidity (20-80%) control.

This command has also developed and equipped several **MOBILE FIELD LABORATORIES** to study the visual, vestibular, and auditory sensory systems. These tests, by virtue of the trailers' mobility, permit our researchers to collect data at training sites, in Navy and Marine Corps operational settings, and on board ships.

Naval Aerospace Medical Research Laboratory
Pensacola, FL 32508-1046
(850) 452-3286

CO: Captain L.H. Frank, MSC
Technical Director: Dr. Robert Stanny

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1	0.671	NA	0.066	0.737
6.2	0.715	NA	0.135	0.850
6.3	0.404	NA	0.041	0.445
Subtotal (S&T)	1.790	NA	0.242	2.032
6.4	0.611	NA	0.074	0.685
6.5	0.190	NA	0.005	0.195
6.6	0.000	NA	0.000	0.000
6.7	0.000	NA	0.000	0.000
Non-DOD	0.000	NA	0.000	0.000
TOTAL RDT&E	2.591	NA	0.321	2.912
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.000	NA	0.000	0.000
Other	0.554	NA	0.132	0.686
TOTAL FUNDING	3.145	NA	0.453	3.598

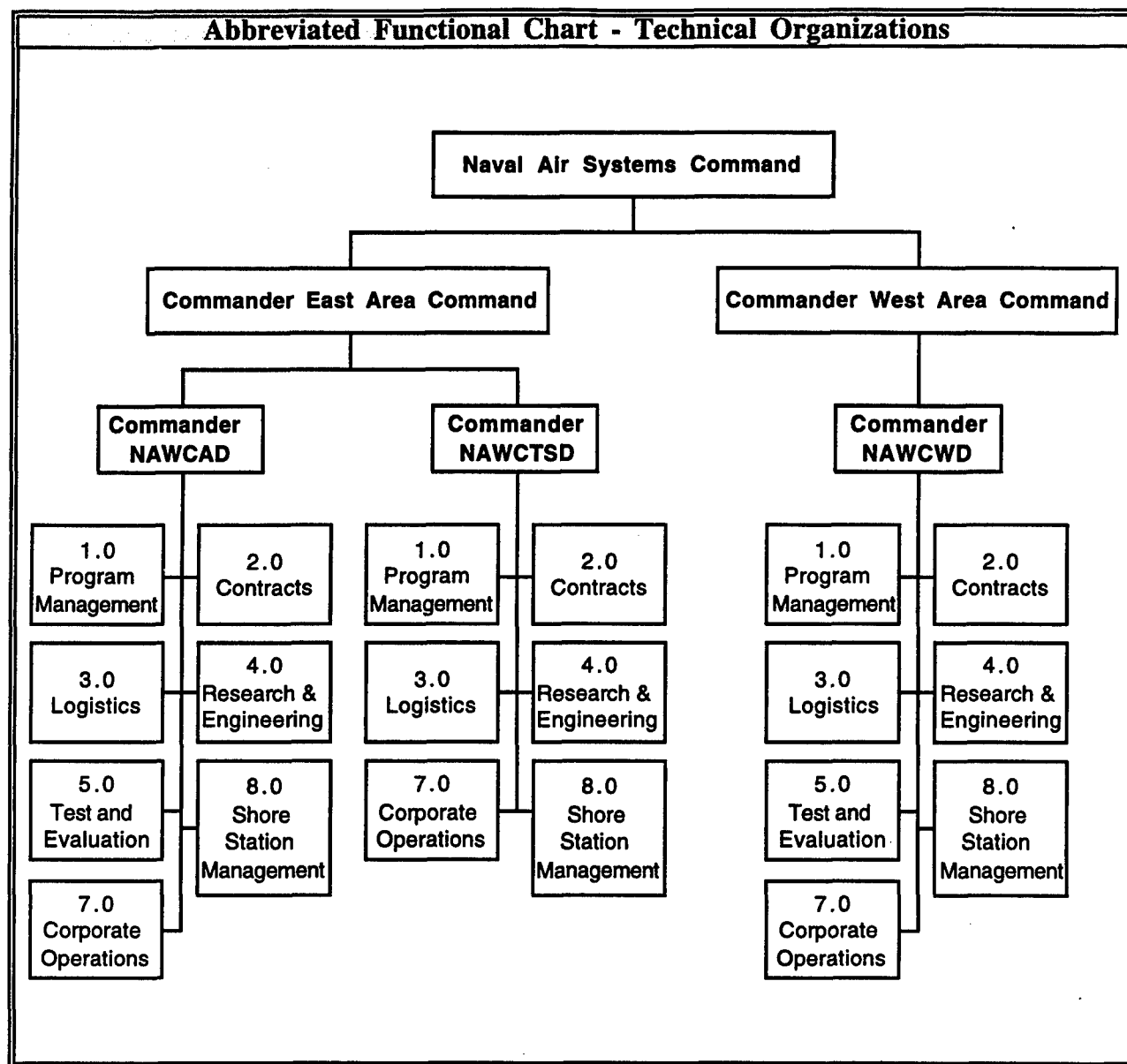
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	9	2	13	24
CIVILIAN	3	8	15	26
TOTAL	12	10	28	50

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	102.900	REAL PROPERTY	13.000
ADMIN	6.700	* NEW CAPITAL EQUIPMENT	0.000
OTHER	10.200	EQUIPMENT	6.200
TOTAL	119.800	* NEW SCIENTIFIC & ENG. EQUIP.	0.114
ACRES	3	* Subset of previous category.	

NA = Not Applicable

Naval Air Warfare Center



Naval Air Warfare Center
Patuxent River, MD 20670
(301) 757-7692

Commander NAVAIR: VADM John A. Lockard
Dep Commander NAVAIR: Dr. Alan Somoroff

MISSION

Our mission is to be the Navy's full spectrum research, development, test and evaluation, engineering, and fleet support center for air platforms, autonomous air vehicles, missiles, weapons and sensors used to conduct air warfare; and to be the principal Navy center for acquisition and product support of training systems.

The Naval Air Warfare Center is composed of three Divisions: The Aircraft, Weapons, and Training Systems Divisions. The Commander of the Training Systems Division reports to the Commander, Aircraft Division who is also designated as the Commander, East Area Command. The Commanders of the Aircraft and Weapons Divisions report directly to the Commander of the Naval Air Systems Command who holds responsibility for the Naval Air Warfare Center activity.

CURRENT IMPORTANT PROGRAMS

EAST AREA COMMAND

AIRCRAFT DIVISION

V-22 Full Scale Development

MV-22 Engineering and Manufacturing Development

F/A-18 E/F Integrated Test Team flew seven Engineering and Manufacturing Development test aircraft (five single seat "E" and two two-seat "F"s). Completed initial carrier suitability sea trials.

F/A-18 E/F Low Production Qualification environmental/special tests completed in Naval Air Warfare Center Aircraft Division Trenton's sea level cells.

F/A-18 Production and Systems Development completed AMRAAM Weapons Separation Flights, AN/ALR-67 (V)3 Gun Fire, CVS catapult/arrested landing flights, ASCIET detachment flight evaluations, ATARS Digital Tape Recorder flight evaluations, ATARS Engineering Development Model (EDM) Data Link flight evaluations, several PALS certifications, Departure Demonstration Phase I, Centerline Tank Configuration, Improved Fresnel Optical Landing System (IFOLS) flights, JDAM Adjacent Stores Loads/Safe Separation flights, catapult/arrested landings, and began Leading Edge Flap flight evaluation.

F-14 completed Digital Flight Control System (DFCS) training, Tactical Air Reconnaissance Pod System Digital Imaging System (TARPS (DI)), ground and flight tests for carrier suitability and Electromagnetic Compatibility. Completed Low Altitude Navigation/Targeting Infrared For Night (LANTIRN) Targeting System (LTS) for F-14D and F-14B Upgrade.

C-9B/DC-9 (ACAT IVM Program) for avionics upgrades passed Milestone III approval for full rate production review. Initial prototype installation completed.

Joint Strike Fighter (JSF) Flight Demonstrations Program will use Patuxent River as one of its two major test sites in FY 2000. Patuxent River used as primary Modeling and Simulation Facility for entire JSF Program.

CURRENT IMPORTANT PROGRAMS (continued)

Air Combat Environmental Test and Evaluation Facility (ACETEF) designated as JSF prime modeling and simulation site. Completed several Engineering and Manufacturing Development test objectives including clean wing flutter envelope definition, clean wing flight loads survey, clean wing carrier suitability test, Electronic Warfare ground tests (using both the Anechoic Chamber and ACETEF facilities), and Radar Cross Section measurements.

S-3B AWW-13 Data Link POD conducted ground testing of the AWW-13 Data Link POD on a VS-31 S-3B to support fleet demonstration of S-3B control of the Standoff Land Attack Missile (SLAM). Developed the initial loading, release, and control checklist. First Improved Extended Echo Ranging (IEER) system flight test in the S-3B.

ES-3A completed Developmental Testing on the Communications Improvement Program, Link 11, Fleet Issue 4 Software and the new missions systems data loader.

SH-60 completed Air Vehicle Integrated Diagnostics System, Helicopter Integrated Diagnostics System and Helicopter Use Monitoring Systems Evaluations. Completed Seat Side Armor & Ballistic Floor Armor Evaluations. Installed FLIR/HELLFIRE installation on 163783 and 165154, and began FLIR/HELLFIRE testing.

P-3 Maverick Missile completed modification of 17 of the 18 scheduled fleet P-3 aircraft. Separation testing of Maverick from wing stations 11 and 16 was completed.

Standoff Land Attack Missile (SLAM) completed separation testing of SLAM from wing stations 11, 13, 14, & 16.

ASUW Improvement Program (AIP) rapidly progressing toward independent Operations Testing after completing 244 flight hours dedicated to Developmental Testing & Joint Developmental Testing/Operational Testing. Demonstrated improved ASUW capabilities.

EP-3 Special Sensor Improvement Program (SSIP) completed Phase I of DT IIIB for first production. SSIP aircraft and associated software under budget and on schedule.

AIRCRAFT SYSTEMS AND TACTICAL AIRCRAFT SYSTEMS:

C-3 Technology, E-2 Squadrons, F/A-18, F/A-18EF, V-22, JAST, T800 (LNX) Engine Qualification Program, Unmanned Air Vehicle, Aircraft Materials, Air Crew Systems Development, Airborne ASW Surveillance, Aviation Survivability, Carrier Systems Development, IFF System Development, Aircraft Technology, RDT&E Ship Support, Aviation Improvements.

ELECTRONIC WARFARE:

TACAIR EW Electro-Optics and Infrared R&D Electronic Research, EW Development.

ANTI-SURFACE WARFARE:

Undersea Warfare Advance Technology, ASW System Development.

TECHNOLOGY BASE:

Sensors/seekers (AIR, EO, RF) Propulsion, Materials Technology, IHPTET Program Management, Weapons and Aircraft Modeling and Analysis, Mission Support Technology, Air Systems and Weapon Advanced Technology, Shipboard Aviation Systems, Acoustic Search Sensors, Target Systems Development, Standards Development, Navy Strategic Communications, Advance Technology Transition T&E Support, Major T&E Investment, NAVSTAR GPS Equipment, In-House Independent Laboratory Research Materials-Electronics and Computer Technology Readiness Training Environmental Quality Technology, Fleet Technology Support.

CURRENT IMPORTANT PROGRAMS (continued)**TRAINER PROGRAMS:**

Research and Technology development in Instructional Technology, Simulator Networking, Tactical Decision Making Under Stress, Embedded Training Technology, Deployable Training, Virtual Environmental Training, Sensor Simulation, Weapons Teams Simulation, Scenario Development, Simulator Sickness, Aircrew Coordination and Software Technology for Adaptable Reliable Systems, Consolidated Training Systems Development, Fleet Air Training.

AIR LAUNCH RECOVERY EQUIPMENT (ALRE):

Electromagnetic Aircraft Launch Systems (EMALS), Radfale Aircraft Support.

COMMON SUPPORT EQUIPMENT (CSE):

Standard Engine Test Systems (SETS), Universal Jet Air Start Unit (UNJASU), Consolidated Automatic Support System (CASS).

OTHER:

Vessel Tracking System, Propulsion/Materials exploratory and advanced development product support, targets and simulators for air-launched systems, threat simulator development, operation of land and sea ranges.

TRAINING SYSTEMS DIVISION**RESEARCH AND TECHNOLOGY**

Instructional Technology, Simulation Technology, Tactical Decision Making Under Stress, Embedded Training Technology, Deployable Training, Virtual Environment Training Technology, Sensor Simulation, Weapons Teams Simulation (including work for the National Institute of Justice), Scenario Development, Training Effectiveness Assessment Methodology, Transportable Strike/Assault Rehearsal Systems, Live Fire Test Program, SBIR, Distributed/Joint Training, and Technology Transfer including the following Cooperative Research and Development Agreements (CRADAs):

Commercialization of Simulation Technology: Investigate the commercialization of military technology for entertainment applications.

Firearms Training Systems for Commercial Applications: Application of research methods to demonstrate and evaluate firearms training systems for commercial applications.

Transportability of Flight and Simulation Software To Digital Equipment Company (DEC) Equipment: Demonstrating and evaluating the probability of simulation software to DEC equipment in support of Distributive Interactive Systems (DIS).

Network Interface Unit for DIS: Collaborate on DIS projects.

Prototype Training Systems Using Low Cost PC Based Image Generator Technology: Jointly develop and assess rapid prototypes of training systems using P10, a PC-based image generator and supporting software.

MARINE CORPS GROUND PROGRAMS

Advanced Assault Amphibious Vehicle, Assault Amphibious Vehicle, Combat Vehicle Training System, Combined Arms Staff Trainer, Contractor Operation and Maintenance of Simulators, Light Armored Vehicle - Full Crew Interactive Simulation Vehicle, Modeling and Simulation/Distributed Interactive Simulation, Multiple Integrated Laser Engagement System, Precision Gunnery Training System, Range Instrumentation System, Small Unit Tactical Trainer, Training Situation Analyses (various), and Universal Maintenance Training System.

CURRENT IMPORTANT PROGRAMS (continued)**AVIATION**

EA-6B, F-14, A-6E, S-3, E-2C/C-2A, P-3, SH-2&3, SH-60B/F, T-45, T-34/44, TA-4/T-2, UNFO, JPATS, LSO, ATC, AV-8B, KC-130, V-22, AH-1W, CH-46, CH-53, UH-1N, F/A-18, HH-65, COMS/CSI/CACT/ISD/ICW, A-School, HH-60J, MH-53, AUTECH, E-6A, UAV, JTCTS, TRADEM, TOURS, TSRA TOOLS, UNFO, TH-57C, V-22, OTT, FAA, EP-3/ES-3 (MAST), C2P, TIDES, Naval Aviation Survival Training Program, Joint Aviation Strike Technology, Joint Oil Analysis Program, Joint Acquisition Management System.

SURFACE

Close in Weapons Systems, Naval gunfire System, Centerboard, Cryptological Trainers, Modification Program, MK 162, Mine Countermeasures, Hot Plant, JSIMS, Bridge/CIC Trainer, Mobile Pierside Trainers, Forward Observer Training System, ASW Team Training, Propulsion, Fire-Fighting Trainers, Landing Craft Air Cushion Trainer, Seal Delivery Vehicle Trainer, COMS, Propulsion Trainers, Battle Force Team Training, Maritime Component Training, Barge Ferry Trainer, Small Arms Marksmanship Trainer, General Mechanical Maintenance Trainer, LPD-17, SC21, CV(X); Foreign Military Program; and Coast Guard: Buoy Tenders, On-scene coordinator, Shipboard Command and Control System, Icebreaker, Coastal Patrol Boat, Vessel Traffic Service, and Oil Spill Management System.

UNDERSEA

Seawolf, Trident, New SSN, Damage Control, Integrated Undersea Surveillance System, SSN 688, Ship Control Systems, Navigation Piloting, SSN Torpedo Room Trainer, Authoring of Instructional Materials, COMS, Submarine Battle Force Team Training, Sub-employment, Training Technology, Tactical Advanced Computer Operator and Maintenance Labs, Electronic Training Environment, Authoring Instructional Materials (AIM), and Computer Improved Instructor's Training Aid.

WEAPONS DIVISION**Weapons systems Test and Evaluation:**

AMRAAM, HARPOON, JDAM, JSOW, SLAM, SPARROW, Standard Missile, and Tomahawk.

Weapons System Integration:

EA-6B Aircraft, AH-1W Aircraft, F-14 Aircraft, F/A-18 Aircraft, JSF.

Weapons Systems:

Evolved Sea Sparrow (ESSM), Gator, HARM, HARPOON, HELLFIRE, JDAM, Phoenix, SLAM ER, Rolling Airframe Missile (RAM), Sidewinder, Tomahawk, Penguin.

Electronic Warfare and Information Warfare Systems:

AN/AAR-47 Warning System, AN/ALE-29, 39, 47 and 50 Countermeasures Systems, AN/ALR-66 and AN/ALR-67 Warning System, Weapons support systems, IRCM, Integrated Defense Electronic Countermeasures (IDECM).

Other:

Crew systems; Parachutes; materials research, Propulsion/materials exploratory and advanced development product support, Targets and simulators for air-launched systems, Threat stimulator development; warheads; fuzes; insensitive munitions; TAMPs; aircraft survivability; sensor systems; laser/optical systems; nuclear safety; guidance & control systems; foreign military sales support; operation of land and sea ranges for RDT&E and fleet training.

EQUIPMENT/FACILITIES**EAST AREA COMMAND****AIRCRAFT DIVISION****Patuxent River Station, MD:**

Facilities include: Chesapeake Test Range, Manned Flight Simulator, Air Combat Environmental Test and Evaluation Facility (ACETEF), Antenna and Avionics Test Facility, Electronics Systems Test Facility, Landing Systems Test Facility, Catapult and Arresting Facility, Ship Ground Station, RDT&E hangars, aircraft maintenance facilities, catapult launch system, landing systems test facility, automatic carrier landing system, marine air traffic control, range EW and flight radar cross-section facility, aircraft electrical and environmental evaluation facility, helo-ship data link evaluation, EW integrated systems test lab, anechoic chamber, electromagnetic environmental effects facility, EW closed loop facility, target support facility, solar radiation facility.

FACILITIES ASSOCIATED WITH THE NAWCAD PATUXENT RIVER COMPONENT

Aircraft Electrical Evaluation Facility (AEEF) - Provides RDT&E on aircraft electrical systems.

Aircrew Systems Test Facility - Provides RDT&E of aircraft life support systems.

Aircraft Stores Certification Facility - Provides T&E of fixed and rotary wing aircraft/armament compatibility.

Flight Control Computer Test - Part of ACETEF Manned Flight Simulator System.

Integrated Aircraft Test Laboratory - Provides for DT&E of avionics systems into tactical aircraft, and supports technology demonstrator aircraft.

Aircraft Support Systems Test Facility - Conducts DT&E of fixed-wing and rotary wing command and peculiar support equipment (SE).

Airborne Strategic Communication Engineering and Test (ASCET) Facility - DT&E and system engineering function for Navy Airborne Strategic Communications aircraft and mission systems.

E-2C Systems Test and Evaluation Laboratory (ESTEL) - DT&E and system engineering on Navy Airborne Early Warning aircraft and mission systems.

Helicopter Missions Systems Support Center (HMSSC) - Provides DT&E support of mission systems for maritime rotary wing and VTOL aircraft.

Fixed Wing ASUW & ASW Lab - Design, test and evaluation of operational hardware and software for S-3 and P-3 aircraft.

Project Beartrap Facility - Support avionics systems in the fleet units assigned to CNO Project K-416 (Project Beartrap).

ACETEF (Air Combat Env T&E Facility) - A fully integrated ground RDT&E facility - full spectrum evaluation of highly integrated aircraft and systems.

C7 Catapult, MK7 Arresting Gear and Take-Off Assist Fac - Shore based tests to determine structural and functional capabilities of a/c for operations aboard a/c carriers.

EQUIPMENT/FACILITIES (continued)

Landing System Test Facility (LSTF) - Supports air traffic control, approach, and landing systems.

Propulsion System Evaluation Facility - Perform RDT&E of aircraft propulsion systems and their components and accessories.

Ship Ground Station - Supports DT&E between ship and air mission elements of helicopters, fixed-winged maritime and UAVs.

A/C Armament Sys Simulation Eng Est Station - Analyze the compatibility of the interface between aircraft and stores.

EW/Avionics Flight Test Facilities - Part of Atlantic Range's Chesapeake Test Range (EW systems performance and RC measurements).

Antenna Testing Lab Automated System (ATLAS) - Conduct in-flight antenna measurements and analysis of antenna systems (part of ESTF).

Aircraft Test and Evaluation Facility (ATEF) - DT&E of installed aircraft subsystems and controlled environmental during static and engine operating conditions.

Electro-Optical & RECCE System Test Facility - DT&E of weapon systems on electro-optic (EO) and reconnaissance (REECE) systems.

Combat Identification Data Analysis Center - DT&E and systems engineering of identification systems (part of ESTF).

Ground Range Antenna Test Fac (GRATF) - Conduct ground range antenna radiation pattern measurements on aircraft antennas (part of ESTF).

Acoustic Test Facility (ATF) - Supports laboratory and flight test evaluations of ASW Acoustic Sensor Processing and software programs.

Communication Tests and Evaluation Lab (COMTEL) - Integrated communication and information data links/antenna system (part of ESTF).

Surveil and Topographical Analysis Radar System Lab - T&E of airborne surveillance, weather, and topographical analysis radar systems (part of ESTF).

Communications Facility - Provide communication support for range instrumentation of the Chesapeake Test Range.

Telemetry Data Center - Receive, record, process, and display data telemetered from test vehicles.

Aircraft Modification & Instrumentation Facility - Aircraft instrumentation, modification, and prototyping for RDT&E Flight Programs.

NAWCAD Pax Riv/NASA Wallops/Key West/Solomons Island - Target Support Facilities - Aerial, ship and other target support for Atlantic Range.

T&E Data Processing (Software and Applications) - Real-time and post-flight analyses and reduction of test data.

EQUIPMENT/FACILITIES (continued)**ADDITIONS - NAWCAD PATUXENT RIVER COMPONENT**

Acoustic Sensor Development Lab - RDT&E of airborne acoustic sensors and data acquisition systems.

Aerodrome - RDT&E aircraft hangar facilities, maintenance, runways and air operations.

Air Interoperability Center - Integrated ACETEF with the other laboratories and facilities at Patuxent River.

Air Vehicle R&D Laboratory - Conduct research and development for naval airframes and air vehicle subsystems.

Aircraft RDT&E Tower - Mounting aircraft right side up or upside down, in an electromagnetic free space environment.

Anechoic Chamber - Provides secure, no-echo test environment for single tactical-sized aircraft system simulation.

Anechoic Chamber; Large - Provides secure, no-echo test environment for multi-system simulation (large/multiple a/c).

Anechoic Chambers - Three anechoic chambers provide for scaled antenna and radar cross section measurements.

Antenna RDT&E Tower - Long range antenna RDT&E facility.

Chesapeake Test Range (CTR) - Synergistic full-spectrum RDT&E for a/c systems tech, flying quals, propulsion, avionics and a/c-ship interfaces.

Computer R&D Laboratory - Conduct research and development of aircraft computer and supporting system hardware.

Ejection Tower - RDT&E of ejection seats, restraint systems, or the injury potential of any man-mounted equipment.

Electronic Systems Test Facility (ESTF) - Provides ground and flight RDT&E for the full range of communications systems.

Electronics Sensor R&D Laboratory - Conduction research and development of EW, EO, IR, and RF sensors.

Horizontal Accelerator - Used for the verification and validation of aviator's equipment performance as part of their quals before fleet introduction.

Hydraulics Research Lab - Provides developmental testing of naval aircraft hydraulic components.

Navy Aircraft Materials - RDT&E Facility - Provides materials RDT&E for naval aircraft and the ocean environment.

Navy IFF T&E Lab - Provides systems engineering and T&E of identification systems (part of ESTF).

EQUIPMENT/FACILITIES (continued)

NAWCAD Lakehurst Outdoor Aero-propulsion Test Site (OTS) - Variable attitude uninstalled engine facility.

Propulsion Systems Evaluation Facility (PSEF) - RDT&E of small scale engines, engine accessories, fuels and lubrication systems.

Ship and Shore Electronic Systems RDT&E Facility - Provides RDT&E for ATC system, ID system, SPECWAR, communication, shipboard data link & systems external communication.

Technical Info Dept Television Production Facilities - Provides mission-related VI technical documentation (video) and VI technical reports.

Technical Information Department Photographic Laboratory - Provides ground and aerial photographic and video services to NAWCAD, NAS, and tenant activities.

V-22 Electronic System Test Lab (VESTL) - Provides development testing facility to playback flight history of parameters on multi-function displays.

Vertical Flight Laboratory - Provides RDT&E of Helo fleet avionics and software products.

VH Facility (HS-2) - Verifies and validates VH avionics hardware and software in a controlled environment.

VP Program Hardware Integration Center (PHIC) - Provides hardware support for the P-3C aircraft.

VP Software Development and Support Facility - Computer program generation facility that supports mission software used by the P-3C aircraft.

VS Software Development and Support Facility - Provides development and life cycle support for the S-3A/B Weapon System software

FACILITIES AT NAWCAD/NAES LAKEHURST SUBORDINATE ORGANIZATION

Steam Catapult Complex - RDT&E on catapult systems (C-13 MOD0, C-13 MOD2), and components, conduct ISE investigations, evaluate aircraft compatibility.

Runway Arrested Landing Site - RDT&E on arresting gear systems and comp (MK7 MOD2/MOD3, E-28); conduct ISE investigations, evaluate aircraft compatibility.

Jet Blast Deflector Site - RDT&E on shipboard JBD systems and components; conduct ISE investigations, evaluate aircraft compatibility.

Test Runway - 12K ft runway dedicated to a/c launch and recovery equipment (ALRE) and Visual Landing Aids (VLA) system, evaluate aircraft compatibility.

Jet Car Tracks (3) - Develop arresting systems in safe environment, aircraft barricade tests, ISE investigations; evaluate aircraft compatibility.

Elevated Fixed Platform/RAST - RDT&E for helo RAST systems, develop and evaluate aircraft tie-downs and helo securing and traversing systems.

Universal Lighting Pad - RDT&E of VLA configuration for helos; evaluate aircraft tie-downs and helo securing and traversing systems.

EQUIPMENT/FACILITIES (continued)

Support Equipment Mobility Site - Development and prototype evaluation of wheeled, shipboard ground support equipment (SE).

Prototype Manufacturing Facility - RDT&E prototype facility for ALRE and SE; manufacturing facility for flight critical ALRE components.

Automatic Test Equipment Software Center - CASS/common ATE software support active, develop P31 for CASS systems software; support in-service SE software.

Environmental Test Lab - Simulate shipboard environmental conditions for ALRE and SE development and evaluations.

Electromagnetic Interference Test Facility - Simulate shipboard electromagnetic interference conditions for ALRE & SE development and evaluations.

Product Development Lab - ALRE and SE engineering design and development and system integration, support ISE investigations.

Component Analysis Lab - ALRE-SE EI of mechanical/metallurgical failures; component/material quality validation.

ADMACS/ISIS Facility - RDT&E, mock-up and evaluate shipboard configuration for ISIS, aviation data management control system & AWMS.

Electro-Optics Lab - Develop and test electro optical tracking, infrared imaging, and laser based equipment for ship VLA & LSO systems.

Power Lab - Evaluate electro-magnetic launcher components and subsystems.

Photometrics Lab - Photometric/radiometric measurements for ALRE VLA systems and product development; evaluate VLA compatibility with NVG.

Visual Landing Aids Lab - RDT&E of new VLA concepts and VLA design cods; conduct ISE investigations for VLA systems.

Aircraft/Weapons Compatibility Lab - Provide aircraft carrier deck cycle, maximum density and operational spotting analysis for ship/aircraft compatibility.

Wind Measuring Instrumentation (WM) Lab - RDT&E and product improvements for WMI systems; ISE investigations.

Metrology and Calibration Lab - Provide calibration of mechanical and electronic devices used in ALRE and SE development.

Data Handling Center - Analyze and archive shipboard and ground-based launch and recovery data.

Landing Guidance Development Facility - Develop advanced landing guidance systems and simulate performance with advanced hardware and man in the loop.

Gyroscopic Test Stand (part of OTS) - Test full-scale propulsion systems to demonstrate aircraft engine operability under simulated conditions.

EQUIPMENT/FACILITIES (continued)

Variable Attitude Test Stand (part of OTS) - Test aircraft engineer operations under variable conditions.

Turntable Test Stand (part of OTS) - Test aircraft engines rotated through positions showing various profiles.

Parachute/Drop Zone - Support joint service parachute jump and cargo drop training.

Trenton, NJ:

Facilities include: large and small engine altitude test area, large engine sea level test cells, rotor spin facility, fuel and lubricants facility, helicopter transmission test facility.

TRAINING SYSTEMS DIVISION

Facilities at the Naval Air Warfare Center Training Systems Division Orlando, Florida consist of a three building complex located on 40.5 acres of Navy owned land in the Central Florida Research Park, adjacent to the University of Central Florida. This modern complex is the result of a \$23.5M FY 85 Navy MILCON project that the organization occupied in mid-1988. The facility totals 298,020 square feet of office and laboratory space, cafeteria, conference and meeting rooms, a high bay area, and HVAC/mechanical complex along with several acres of paved parking. In addition, NAWCTSD occupies approximately 19,563 square feet of administrative and storage space as a tenant elsewhere in the Orlando Navy complex and nationwide at the 43 field site locations.

WEAPONS DIVISION

MISSILE ENGAGEMENT SIMULATION ARENA (MESA): MESA is used by all services to evaluate and verify interactions between air vehicle targets and missile sensors for determination of missile lethality, air-vehicle survivability, measurement of end-game properties, and development of new anti-air weapons to meet evolving threats.

MISSILE AND AIRCRAFT WEAPON SOFTWARE SUPPORT ACTIVITIES (WSSA): NAWCWPNs uses specially equipped laboratories to support weapon system integration onto aircraft, independent software verification, validation and performance testing, and provides the unique capability to integrate weapon systems to platforms at a single site.

EXPLOSIVES & PROPULSION LABORATORIES: A complex of laboratories which provides facilities for research in the fundamentals of propellant and explosives technology.

FULL-SCALE SURVIABILITY & VULNERABILITY FACILITY: This facility provides the capability to test and evaluate the vulnerability and lethality of air systems through full-scale, live-fire testing and computer simulations.

FUZE AND SENSORS LAB: Provides consolidated engineering laboratory space for air-to-air, air-to-surface, and surface-to-air, and fuze and sensor research, development, test and evaluation in direct support of NAWCWPNs assigned programs.

EQUIPMENT/FACILITIES (continued)

RADAR CROSS-SECTION MEASUREMENT FACILITY: The Junction Ranch Radar Cross-Section Measurement facility is used to measure radar cross-sections of low-observable vehicles.

INFORMATION & ELECTRONIC WARFARE (I&EW) SYSTEMS LABORATORIES: The various NAWCWPNS I&EW systems laboratories provide life-cycle support for airborne EW systems, including warning receiver, jammer, EO/IR, missile-warning, countermeasures, and support systems; software support for the EA-6B aircraft as well as for prime multiplatform EW systems; and system engineering support, including system design and integration, development of information systems, and fleet system software upgrades for warning, jamming, and decoy systems.

ELECTRONIC COMBAT RANGE CAPABILITIES: At the Electronic Combat Range, NAWCWPNS provides a free-space laboratory for engineering support, testing, analysis, training, and development of systems and technologies that counter or penetrate air defenses. These capabilities are essential to full-spectrum electronic warfare system testing.

HARDWARE-IN-THE-LOOP SIMULATIONS: Extensive simulation capabilities supporting weapons design and development include six-degree-of-freedom (6 DOF) hardware-in-the-loop (HWIL) facilities.

AIR WARFARE EVALUATION FACILITY: A 121,000 sq. ft. missile system evaluation laboratory which can perform secure missile-in-the-loop seeker-performance testing under simulated operational conditions and against high-fidelity target presentations.

MISSILE & AIRCRAFT SOFTWARE VALIDATION & TESTING LABORATORIES: Laboratories are available to support independent software verification, validation and performance testing.

WEAPON SYSTEM INSTRUMENTATION & DATA ANALYSIS: These facilities support instrumentation requirements related to tactical missile, aircraft, and other product testing areas. The data analysis laboratories provide near-real-time data extraction and evaluation for timely assessment of aircraft/weapon integration and missile system performance.

RANGE CAPABILITIES: The air, land, and sea ranges and test facilities contain 1,700 square miles of dedicated land, underlying more than 17,000 square miles of restricted air space, and 36,000 square miles of sea test range with overlying air space.

OTHER SPECIAL CAPABILITIES: Specialized facilities are used for electronics research leading to complete life-cycle support of fire-control systems, guidance-and-control systems for missile weaponry, sensors, and fuzes. In addition, NAWCWPNS has unique capabilities provided by its EO/IR laboratories, anechoic chambers, strategic-systems propulsion test facilities, complete photographic laboratory, and a large industrial machine shop.

Naval Air Warfare Center
 Patuxent River, MD 20670
 (301) 757-7692

Commander NAVAIR: VADM John A. Lockard
 Dep Commander NAVAIR: Dr. Alan Somoroff

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	3.377	NA	NA	3.377
6.1 Other	2.330	NA	4.784	7.114
6.2	29.522	NA	48.266	77.788
6.3	34.747	NA	29.386	64.133
Subtotal (S&T)	69.976	NA	82.436	152.412
6.4	93.531	NA	64.683	158.214
6.5	165.392	NA	137.419	302.811
6.6	205.520	NA	181.184	386.704
6.7	151.446	NA	112.119	263.565
Non-DOD	0.084	NA	0.248	0.332
TOTAL RDT&E	685.949	NA	578.089	1,264.038
Procurement	317.368	NA	1,515.704	1,833.072
Operations & Maintenance	340.582	NA	320.391	660.973
Other	55.439	NA	98.678	154.117
TOTAL FUNDING	1,473.260	NA	2,591.564	4,064.824

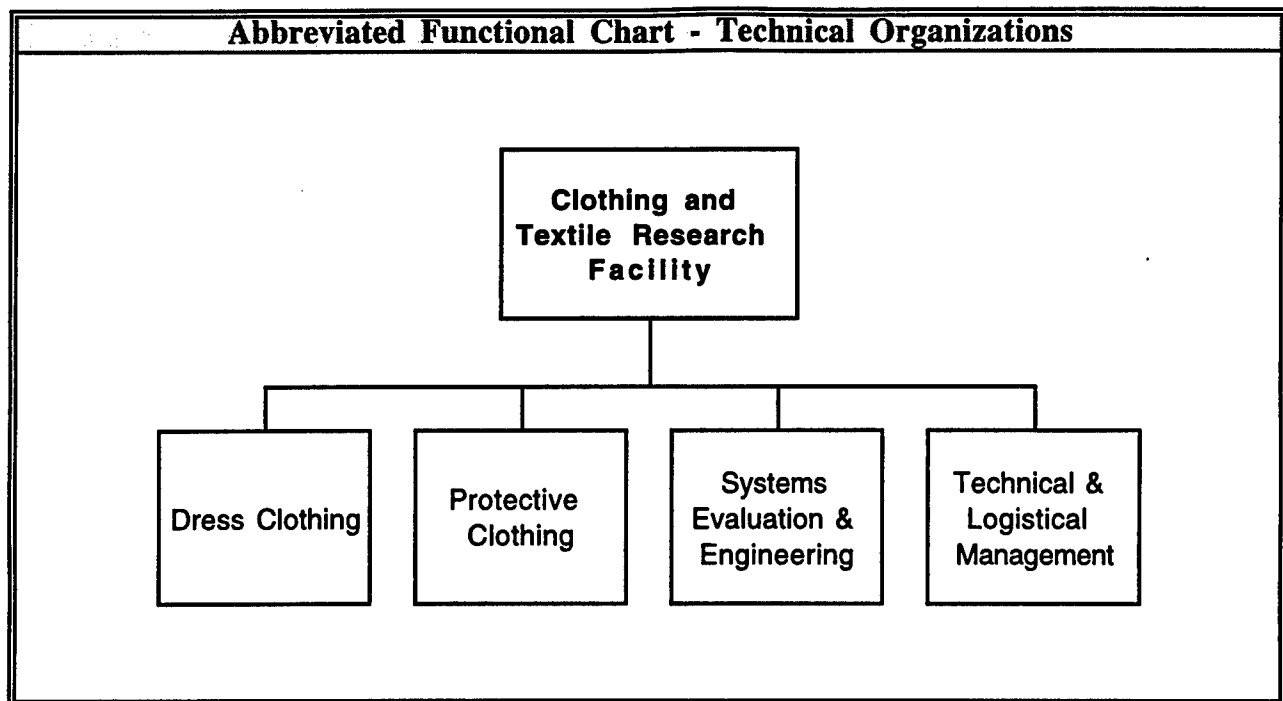
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.253

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	4	215	2,434	2,653
CIVILIAN	238	5,240	8,579	14,057
TOTAL	242	5,455	11,013	16,710

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	6,391.720	REAL PROPERTY	1,504.173
ADMIN	3,031.092	* NEW CAPITAL EQUIPMENT	183.128
OTHER	15,042.288	EQUIPMENT	1,170.245
TOTAL	24,465.100	* NEW SCIENTIFIC & ENG. EQUIP.	49.937
ACRES	1,145,213	* Subset of previous category.	

NA = Not Applicable

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Navy Clothing and Textile Research Facility

Navy Clothing and Textile Research Facility
Natick, MA 01760-0001
(508) 233-4172

Officer in Charge: CDR D. R. Smith
Technical Dir: Barbara A. Avellini, Ph.D.

MISSION

Conduct research, development, test and evaluation and provide engineering support in clothing, textiles, and related fields associated with service clothing and environmental protective clothing.

CURRENT IMPORTANT PROGRAMS

- 1. Joint Services Lightweight Integrated Suit Technology Pre-Planned Product Improvement** which is a joint service program to upgrade garments which will be protective in chemical-biological contaminated environments and can be used in one form or another by all services.
- 2. Shipboard Protective Clothing Program** is designed to provide state-of-the-art, commercially available, firefighter's protective clothing, flame resistant utility uniforms, anti-exposure suits, cold and wet weather ensembles and life-support systems and equipment for Navy personnel which meet appropriate performance requirements for the shipboard environment. Performance requirements/testing procedures are developed at NCTRF to enable commercial products to be qualified through NCTRF laboratory testing and Fleet evaluation. Testing includes conformance to standards and Navy unique requirements designed to analyze the protective capabilities of materials and clothing.
- 3. Electrochemical Compressor** - New technology to power a personal microclimate cooling system which will result in lower weight and more efficient cooling capacity.
- 4. Phase Change Materials** - New technology which will be used to extend the range of comfort for individuals exposed to warm and cold environments, as well as to enhance the performance of protective clothing. This technology can also be useful to the private sector.
- 5. A CRADA** has been established between NCTRF and Batelle, Natick Operations for the purpose of furthering technologies of mutual interest for utilization in protective clothing and equipment.

EQUIPMENT/FACILITIES

Major equipment and facility capabilities include:

A thermal manikin system is used to measure insulation values of protective clothing in both an air and water immersion environment. This is one of only four known manikins worldwide capable of being used in both water and air; the thermal hand and thermal foot are used to measure insulation values of handwear and footwear, respectively. Worldwide, there are only three other known thermal hands and one other known thermal foot; the environmental test chambers reproduce extremes from 0F to 130F at 5% to 95% relative humidity, with wind speeds up to .5 to 15.7 mph. The hydro-environmental simulator is the only known chamber within the Navy that is able to independently control both air and water temperatures simultaneously, and thus simulate any air/water interface. A Gerber Micromark/Silhouette computer-aided design system to grade, alter, and trace patterns, and to cut hard patterns; a shipboard laundry laboratory; a thermal flammability laboratory; physiological test and evaluation equipment. Instron testers, weatherometers, fadeometers, launderometer, tear tester, etc., used to determine the physical characteristics of clothing and textiles. A traversing thermocouple instrumented manikin, used to evaluate fire resistant protective clothing at variable heat flux levels and exposure times, when exposed to a propane-fueled fire in an enclosed area.

Navy Clothing and Textile Research Facility
 Natick, MA 01760-0001
 (508) 233-4172

Officer in Charge: CDR D. R. Smith
 Technical Dir: Barbara A. Avellini, Ph.D.

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	NA	0.000	0.000
6.2	0.420	NA	0.147	0.567
6.3	0.418	NA	0.115	0.533
Subtotal (S&T)	0.838	NA	0.262	1.100
6.4	0.355	NA	0.085	0.440
6.5	0.097	NA	0.004	0.101
6.6	0.000	NA	0.010	0.010
6.7	0.000	NA	0.000	0.000
Non-DOD	0.040	NA	0.000	0.040
TOTAL RDT&E	1.330	NA	0.361	1.691
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	1.511	NA	0.843	2.354
Other	0.021	NA	0.050	0.071
TOTAL FUNDING	2.862	NA	1.254	4.116

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

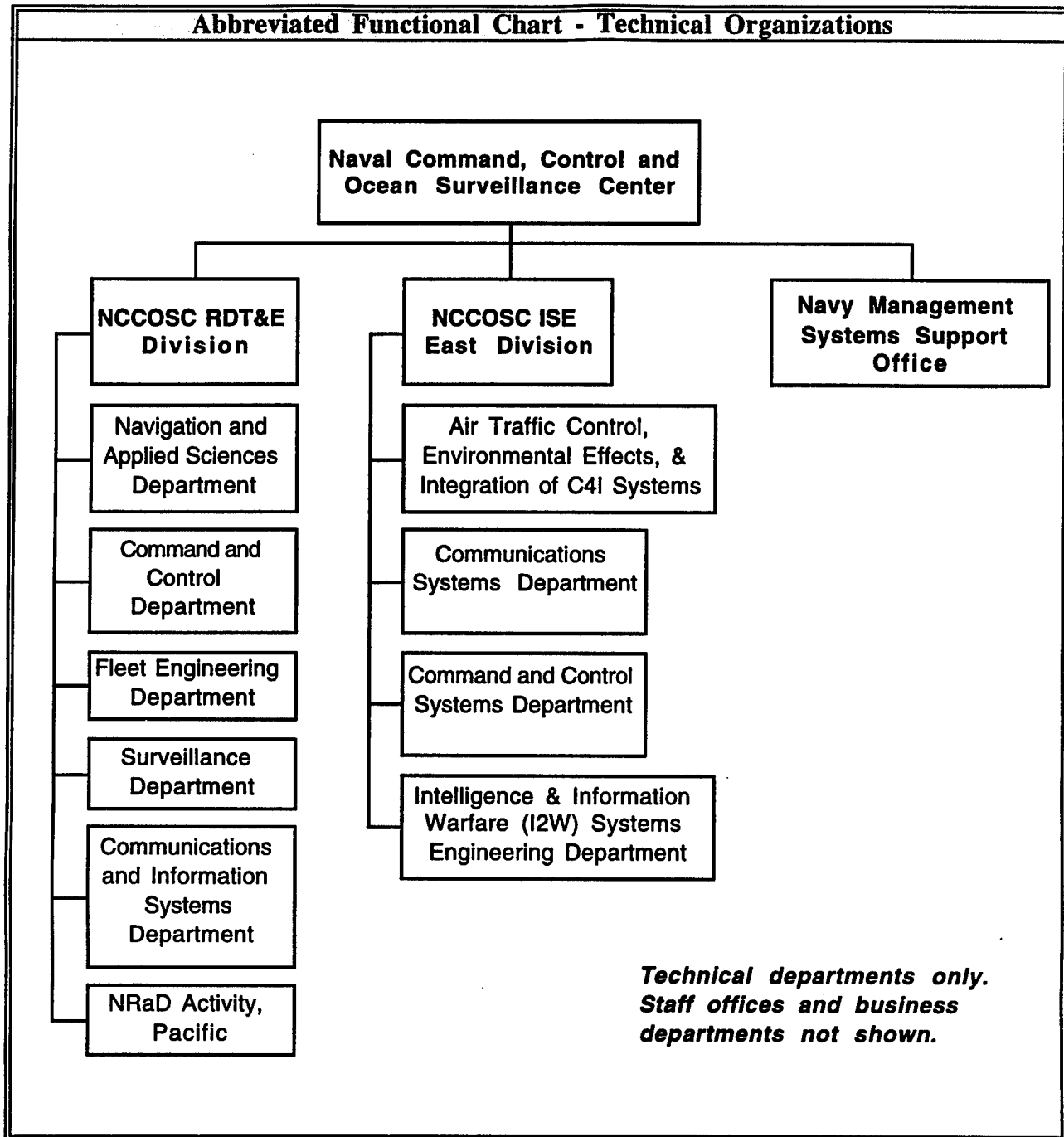
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	1	1
CIVILIAN	1	30	13	44
TOTAL	1	30	14	45

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	12.667	REAL PROPERTY	9.478
ADMIN	16.000	* NEW CAPITAL EQUIPMENT	0.400
OTHER	5.630	EQUIPMENT	2.803
TOTAL	34.297	* NEW SCIENTIFIC & ENG. EQUIP.	0.228
ACRES	0	* Subset of previous category.	

NA = Not Applicable

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Naval Command, Control and Ocean Surveillance Center



Naval Command, Control and Ocean Surveillance Center

San Diego, CA 92147-5088
(619) 524-7014

Director: Paul Wessel
Deputy Cmdr: CAPT T. R. Brown

MISSION

To be the Navy's full-spectrum research, development, test and evaluation, engineering, and fleet support center for command, control and communication systems and ocean surveillance--and the integration of those systems which overarch multi-platforms. Leadership areas:

- Command, Control and Communication Systems
- Command, Control and Communication Systems Countermeasures
- Ocean Surveillance Systems
- Command, Control and Communication Modeling and Analysis
- Ocean Engineering
- Navigation Support
- Marine Mammals
- Integration of Space Communication and Surveillance Systems

CURRENT IMPORTANT PROGRAMS

Global Command and Control System.
Global Positioning System.
Joint Maritime Command Information System (JMCIS).
High Frequency Management System (HFMS).
Navy Tactical Command Systems Afloat (NTCS-A).
Contingency Theater Air Planning System (CTAPS).
Operations Support System (OSS).
Relocatable Over the Horizon Radar (ROTHER).
Ship Automated Communications and Control System (SACCS).
IT-21.
Base Level Information Infrastructure (BLII).
Joint Tactical Information Distribution System.
Link 16/Link 11.
Multifunction Information Distribution System.
SHF/EHF/UHF Satellite Communications.
Submarine Communications.
Tactical Receive Equipment (TRE)/TRE Related Applications.
Theater Missile Defense.
Air Traffic Control (ATC).
Environmental Effects Prediction.
T-AGS 60 Class Project.
Navy Tactical Command System-Afloat.
Fixed Surveillance Systems.
Tactical Support Center/TSC Communications.
Mobile-Miniature Operations Control Center (MOCC).
Naval Modular Automated Communications Systems (NAVMACS II ASHORE).
Universal Protocol Translator (UPT).
Maritime Air Operations Center (MAOC).
Electronic Visual Systems (EVS).
Naval Satellite Control Station (NSCS) Interface Unit (NIU).
OSIS Baseline Upgrade (OBU).

CURRENT IMPORTANT PROGRAMS (continued)

Modular maintenance systems including Strategic Systems Programs (SSP)
 Marine Corps Security, and depot level repair and manufacture of C4I systems
 Intelligence and Information Warfare Systems
 INFOSEC Systems (EIP, AMODSM, SOVR, and Electronic Key Management Systems)

Technology Transfers, RDT&E Division (no personnel currently assigned to firms or institutions):

Company	Title/Work Being Done
Bien Logic	Planet Earth - Next Generation Home Page
Conductus	Hybrid Thin Film CMOS/Supeconducting Circuits
Environmental Tech Group	Potentiometric Scanning
Grumman	Naval Simulation Systems (NSS) Cooperative Development
HI Space Center	Excimer Laser Materials Processing
Lockheed Sanders	Undersea Acoustics & Multi-Mode Source Technology
Loral	HDR Ship to Ship & Ship to Shore Communications
LuminOre	Metal Composite Coating
Marketpath Corporation	NCCOSC RDTE DIV AHA Software Development
Optron Systems	SOS Display Technology
Perry Technologies	Tether Development Project
Proxima	UTSOS for Display Applications
RF Microsystems	Microwave CMOS Micromachined Sensors
RGB & NEOS	3-D Volumetric Display System
Spectrogram	Oil Spill Alarm System
UNISYS Govt. Systems Group	Parallelization of High Order Languages

Technology Transfers, ISE East Coast Division (2 personnel currently assigned):

Company	Title/Work Being Done
Scientific Research Corporation	Explore Development of a Set of Modular Automation Hardware and Software Components

EQUIPMENT/FACILITIES

AN/GPN-27 RADAR SITE (BLDG 3104): An Air Traffic Control (ATC) Airport Surveillance Radar (ASR-8) which provides modification and standardization testing.

ANTARTIC SUPPORT LAB (BLDG T-12): Provides support for Antarctic systems.

ATC LAB AND TESTING FACILITY (BLDG 3442): Provide capability for test of air traffic control systems and support the Emergency Communications System (ECS) Flight Data Input/Output (FCIC), UHF/VHF Program, and houses a FM repeater.

ATC SOFTWARE SUPPORT LAB (BLDG T-6): Provides geo processing and air traffic control software support for ISEA systems.

ATC SYSTEMS SUPPORT LAB (BLDG 3440): Provides CDM support to NAVAIR ATC systems and provides airfield lighting control testing.

AUTOMATED FUEL HANDLING (AFH) (BLDG 3137): Provides software development and hardware integration for the Defense Logistics Agency's Automated Fuel Handling Equipment (AFHE) program. Facility also provides PITCO.

CODE 74 ELECTRONIC SECURITY SYSTEMS (BLDG 22430): Engineer/re-engineer electronic security systems.

EQUIPMENT/FACILITIES (continued)

COMMAND AND CONTROL FACILITY (ST. INGOES BLDG 185): Contains systems engineering, development, test and evaluation capabilities.

COMMAND SSO AND CMS FUNCTIONS (BLDG 3415): Dual usage facility housing SSO and CMS.

Cryptographic Repair Facility supports all Navy cryptographic equipment worldwide.

CRYPTOLOGIC AND INTELLIGENCE SYSTEMS: Provide INFOSEC engineering design guidance, certification and accreditation testing, TEMPEST testing, and Non-Development Item testing of systems. Support to various systems included Tier 1, Tier 2, Mission Computer Upgrade, High Performance Computer Modernization Office, Joint Tactical Combat Training Systems (JTCTS), Cooperate Engagement Capability (CEC), and Embeddable INFOSEC Product (EIP).

CRYPTOLOGIC QUICK REACTION LAB (BLDG 3411): SCIF hardware/software development and testing, systems integration for special operating forces and quick reaction.

DEPOT FACILITY (NORFOLK BLDG EMC): Depot level repair and manufacture of C4I systems. E3: Simulation and test laboratories to support EMC, EMI, and RADHAZ efforts. MIL-STD 461D test enclosure for development of test procedures and applications to directly support the analysis and resolution of fleet EMI problems.

ENGINEERING/LAB FACILITY: Multiple-use facility comprising office space, video teleconferencing laboratory and shock and vibration testing. Provides mock-up capability for integration of MISSI and other network security products such as Firewalls, Standard Mail Guards, Fortezza, etc. Provides capability for test, evaluation and integration of Navy cryptographic equipment. Also, houses a comprehensive TEMPEST test facility, NKMS deployment facility and INFOSEC ISEA capability.

ENVIRONMENTAL TESTING: Environmental test equipment to support temperature, humidity, altitude, shock, vibration, salt spray, etc. testing.

ESS TOWER: Tower for test and evaluation of electronic surveillance sensors. Fleet Maintenance Agent TSTP Lab providing in-service maintenance engineering, design analysis, and evaluation of satellite navigation systems, automated communications equipment, and message processing distribution systems.

FLEET TACTICAL COMMUNICATIONS FACILITY (NORFOLK BLDG 1555): Provides shipboard communications, equipment and test beds, which are linked to various other labs and test beds by land lines, fiber optic cables, data links and other forms of secure communications, and which allow design, fabrication, assembly, testing, and certification of communication interface units and special communications applications. This facility includes RF equipment consisting of HF, VHF, UHF, and SHF transmitters, receivers and associated antenna systems.

INFOSEC LABS (BLDG 3113): Lab 6 provides a comprehensive TEMPEST test facility, Tier 2 test facility, EKMS deployment facility, and the INFOSEC ISEA capability. In addition, provides capability for test, evaluation and integration of Navy cryptographic equipment. Lab 5 provides mock-up capability for integration of network security products such as Firewalls, Mail Guards, Fortezza, etc.

INTEGRATED VIDEO SYSTEMS (IVS) (BLDG T-8): Facility houses two video systems for ISEA and IRF purposes.

ST INGOES BLDG 125 closed due to organizational realignment.

EQUIPMENT/FACILITIES (continued)

INTEGRATION LAB FACILITY (BLDG 3112): Multi-purpose facility housing project/support areas, SCIF and conference center.

INTEL LINK/VTC/NMFO (BLDG 3400): SCIF classified Internet/video teleconferencing/contracting.

IW ENGINEERING AND INTEGRATION WAREHOUSE (BLDG 3113): Multiple use facility comprising office space, video teleconferencing laboratory and shock and vibration testing.

IW EXPLOIT SYSTEMS LBFT (BLDG 3410): LBFT/COTS/MDI support facility. Also, hardware/software development and testing, systems integration of IW exploit systems.

METEROLOGY CALIBRATION LABORATORY (BLDG 450): Specialized facility for electronic and mechanical calibrations.

METOC FACILITY (BLDG 3443): Navy unique test facility for Meteorological and Oceanography (METOC) systems such as ASOS, METFAC, MRS and NEXRAD. Microelectronics Laboratory for the manufacture of products unavailable commercially.

MODULE MAINTENANCE FACILITY (MMF): Serves as a third level maintenance activity for SSP. MMF comprises laboratory, shops and classroom areas. Work performed includes electronic, electrical, optical and mechanical maintenance, upgrades and ISEA support for DOD security systems. Utilized for fiber optic repair and training for arms, ammunition and explosive (AA & E).

NAVAL TACTICAL COMMAND SUPPORT SYSTEMS ENGINEERING TEST FACILITY (NORFOLK BLDG 183): Contains shipboard configurations for SNAP III, SNAP I and II, NALCOMIS with fiber optic and copper LANs with interconnection to other JMCIS labs at St. Juliens Creek Annex. Also, incorporates the Radio Wireline Interface (RWI) Labs.

NAVIGATION SYSTEMS LABORATORY (NORFOLK BLDG 1558): Provides test beds for NAVSSI, conventional navigation, aircraft alignment, inertial navigation and RLGN programs.

Outboard Calibration Facility: the only West Coast signal generation site designed to provide controlled stimulus to calibrate direction finding capability on OUTBOARD ships.

PRECISE TIME AND TIME INTERVAL (PTTI) FACILITY (NORFOLK BLDG 165): Cesium beam frequency and time standards are repaired and maintained on-line.

RADAR OPERATIONAL FACILITY (BLDG 3446): A mock-up air traffic control facility which serves as an interim repair depot for ATC equipment.

RADIAC STANDARDIZATION AND CALIBRATION FACILITY (BLDG 3414): Houses an AN/UDM-1 Calibration Range using Cesium 137 source, the Navy's prime standard for gamma radiation; an ANUDM-7 Calibration using Plutonium 239, the Navy's prime standard for alpha radiation instrument calibration; and a MX-9335 Fast Neutron Range, the Navy's prime standard for Neutron radiation indication and computation instrument calibration. In addition to these standardization systems, this building houses a RADIAC calibration laboratory.

RADIAC TEST AND EVALUATION FACILITY (BLDG 3413): Navy unique test facility of concrete masonry slab on grade construction with special 30-inch thick concrete wall panels housing various high level ionizing radiation sources and environmental test chambers.

EQUIPMENT/FACILITIES (continued)

Research, Evaluation and Systems Analysis (RESA) Facility: a large-scale computer-based simulation/wargaming system used to support a variety of applications including C3I architecture assessment, concept of operations development, advanced technology evaluation, joint exercises, and test and evaluation of advanced systems.

RF COMMUNICATIONS TOWER: Provides air traffic control communications capabilities.

SEOC/TDC/C4I DATA RESOURCES (NORFOLK BLDG 171): Lab provides special C4I configuration to allow flag officer shore based participation in sea exercises. Ship Antenna Model Range includes ground planes, model ships, track, towers, control systems, test equipment, and data reduction computers allowing simulation and modeling of ship communications.

SHIP COMMUNICATIONS LAB (NORFOLK BLDG 277): Facility provides a joint base for SACCs software development and maintenance and ROTH software configuration management.

SHORE AUTOMATED COMMUNICATIONS CONTROL SYSTEM LAB (BLDG 3450): Established Shore Remote Control System (SRCS) testing and diagnostic laboratory which provides technical assistance to operational commands worldwide. Developing Automated Network Control Center/Automatic Technical Control (ANCC/ATC) and Automatic Digital Multiplexing System (ADMS) maintenance and diagnostic laboratory. Provides Pre-Installation, Test, and Check-out (PITCO) support for USCG installations.

SHORE COMMUNICATIONS SYSTEMS CENTER (NORFOLK BLDG 166): Contains operational secure communications interconnected to provide integrated systems and fleet support for Shore Secure Voice, Ship Secure Voice (Single Auto Systems) and SHF Baseband subsystems. Direct land line and on-the-air connectivity to the active Naval Communications Networks enhance Secure Voice ISEA capability by providing end-to-end system validation, remote technical assistance worldwide, development and test of field changes, and design of subsystem interface elements.

Simulated Ships Motion Facility (SCORSBY): large ship motion simulators with the capacity to accommodate navigation systems weighing up to 3,000 lbs. Designed to apply controlled roll, pitch, and heading motions to new technology navigation systems.

SOFTWARE DEVELOPMENT/SPECIAL OPERATING FORCES (BLDG T-5): Software development lab. Southern California communications networking test range that maintains and controls sites at Pt. Mugu, San Nicolas Island, San Clemente Island, Seal Beach, and NRaD, SD, for use in multiforce communications testing and support of west coast fleet exercises.

Surveillance Test and Integration Center (STIC): an RFI-shielded vault that can receive and process data from various sources through on-line communications.

Tactical Systems Support Complex: a Sensitive Compartmented Information facility supporting electronic support measures systems.

USMC ELECTRONIC SECURITY SYSTEM (ESS) SUPPORT (BLDG T-2): Houses lab and engineering repair, training and technical data of ESS/USS DOLPHIN (AGSS 555), a unit of Submarine Development Group One, used for research and development of advanced sonar equipment and systems.

VTC/JMCIS/IXS LAB (NORFOLK BLDG 167): JMCIS AE and ISEA lab for test and design of new tech life cycle support, configuration management and exercise support.

Naval Command, Control and Ocean Surveillance Center
 San Diego, CA 92147-5088
 (619) 524-7014

Director: Paul Wessel
 Deputy Cmdr: CAPT T. R. Brown

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	2.521	NA	NA	2.521
6.1 Other	2.493	NA	4.747	7.240
6.2	37.449	NA	94.004	131.453
6.3	18.016	NA	46.840	64.856
Subtotal (S&T)	60.479	NA	145.591	206.070
6.4	45.431	NA	95.754	141.185
6.5	40.167	NA	44.584	84.751
6.6	5.974	NA	7.529	13.503
6.7	42.121	NA	58.665	100.786
Non-DOD	0.000	NA	0.000	0.000
TOTAL RDT&E	194.172	NA	352.123	546.295
Procurement	186.420	NA	418.912	605.332
Operations & Maintenance	194.321	NA	234.984	429.305
Other	45.227	NA	88.619	133.846
TOTAL FUNDING	632.742	NA	1,185.269	1,818.011

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

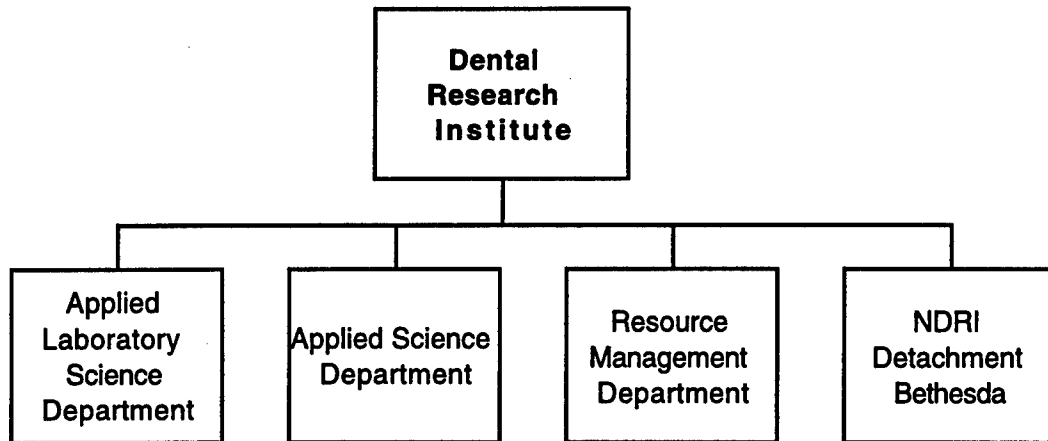
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	19	315	334
CIVILIAN	192	2,190	2,958	5,340
TOTAL	192	2,209	3,273	5,674

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,886.000	REAL PROPERTY	208.000
ADMIN	929.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	1,647.000	EQUIPMENT	209.000
TOTAL	4,462.000	* NEW SCIENTIFIC & ENG. EQUIP.	14.453
ACRES	899	* Subset of previous category.	

NA = Not Applicable

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Naval Dental Research Institute

Abbreviated Functional Chart - Technical Organizations

Naval Dental Research Institute
Great Lakes, IL 60088-5259
(847) 688-5647

Commanding Officer: CAPT Gordon K. Jones, DC
Chief Scientist: Dr. Lloyd G. Simonson

MISSION

To research, develop, test, and evaluate new methods and materials that limit oral disease, reduce dental emergencies, maximize operational readiness, and promote dental wellness for Navy and Marine Corps personnel.

CURRENT IMPORTANT PROGRAMS

1. Test rapid chairside risk assessment tests for dental caries (patent pending), advanced prototypes completed with Editek, Inc.
2. Develop rapid chairside oral disease risk assessment tests (two patents pending), advanced prototype manufacture underway with Devaron Inc. Develop use of fluorescence polarization as technique for rapid diagnosis (NDRI patent pending) with Jolley Consulting and Research Inc.
3. Test system and apparatus to remove mercury from dental waste water (two patents pending). Industrial mercury recovery compound adapted for dental use with Nalco, Inc. Begin evaluation of battlefield/afloat system applications.
4. Develop radiographic system to identify dental disease progression, human testing initiated.
5. Evaluate the Navy-Wide managed dental care delivery system.
6. Collect and analyze dental epidemiologic data.
7. Develop multimedia dental diagnostic and treatment system for forward remote site use, prototype complete.
8. Develop multimedia dental examiner calibration system.
9. Develop improved patient tracking/data collection with Smart card and optical mark recognition.
10. Develop rapid non-invasive salivary assays for presence of antibodies to tuberculosis and other infectious diseases.
11. Test salivary levels of bis-phenol A associated with oral resin systems in collaboration with National Institute of Dental Research (NIDR).
12. Study effectiveness of dental sealants in young adults.
13. Collect and analyze operational dental emergency data.
14. Develop tests for genetic biomarkers for periodontal disease.
15. Develop techniques for dental materials fracture analysis/prediction with National Institute of Standards and Technology (NIST).
16. Evaluate new periodontic and endodontic treatment techniques, equipment, and materials.

EQUIPMENT/FACILITIES

44,235 square feet AAALAC-accredited animal colony.

A comprehensive dental research library, numerous volumes and journals with direct MEDLINE access.

Extensive computer and data processing facilities.

Direct access to large military populations and the Navy's only Recruit Training Center.

Direct access to the American Dental Association, three university dental schools, two large VA hospitals, a large Naval Hospital, a major Naval Dental Center, and the headquarters of nearly 50 leading dental organizations.

A gas chromatography microbial identification system.

Numerous other state-of-the art equipment.

Direct access to the National Institute of Dental Research, National Library of Medicine, the National Institute of Standards and Technology, and National Institutes of Health (NDRI Bethesda Detachment).

Atomic Absorption Spectrometer.

Illinois EPA Certified Waste Water Testing Facility for mercury.

Co-located with U.S. Army Dental Research Detachment.

Total facility capacity = 75,000 sq. ft.

Naval Dental Research Institute
Great Lakes, IL 60088-5259
(847) 688-5647

Commanding Officer: CAPT Gordon K. Jones, DC
Chief Scientist: Dr. Lloyd G. Simonson

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.179	NA	0.000	0.179
6.2	0.000	NA	0.000	0.000
6.3	0.701	NA	0.017	0.718
Subtotal (S&T)	0.880	NA	0.017	0.897
6.4	0.000	NA	0.000	0.000
6.5	0.000	NA	0.000	0.000
6.6	0.485	NA	0.000	0.485
6.7	0.000	NA	0.000	0.000
Non-DOD	0.010	NA	0.000	0.010
TOTAL RDT&E	1.375	NA	0.017	1.392
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.113	NA	0.000	0.113
Other	0.000	NA	0.000	0.000
TOTAL FUNDING	1.488	NA	0.017	1.505

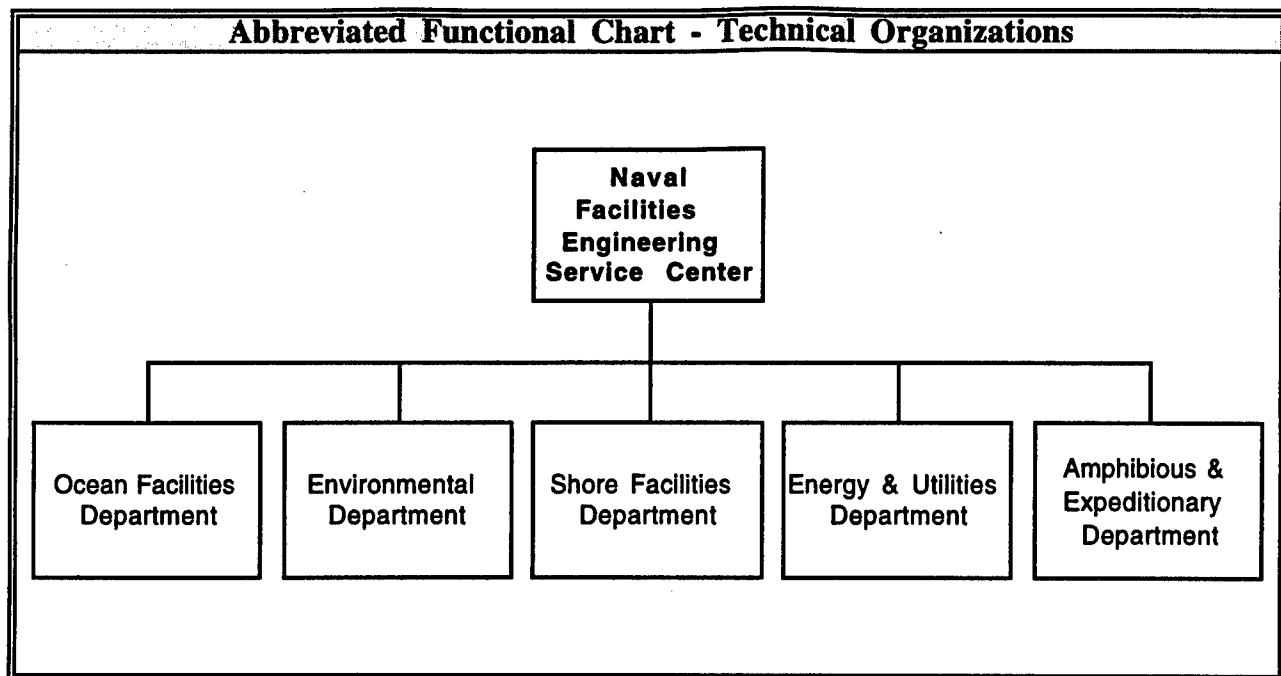
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	25	25
CIVILIAN	3	3	5	11
TOTAL	3	3	30	36

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	21.260	REAL PROPERTY	5.000
ADMIN	6.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	8.000	EQUIPMENT	2.093
TOTAL	35.260	* NEW SCIENTIFIC & ENG. EQUIP.	0.011
ACRES	0	* Subset of previous category.	

NA = Not Applicable

Naval Facilities Engineering Service Center



Naval Facilities Engineering Service Center
Port Hueneme, CA 93043-4328
(805) 982-1393

Commanding Officer: CAPT Donald G. Morris
Business Mgr.: Robert N. Cordy

MISSION

Delivers specialized facilities engineering and technology products and services in Shore, Ocean and Waterfront Facilities, Environment, Amphibious and Expeditionary Operations, Energy and Utilities. Provides solutions to problems through engineering, design, construction, consultation, test and evaluation, technology implementation, and management support.

CURRENT IMPORTANT PROGRAMS

Defense Environmental Restoration Program. Pollution Prevention Equipment Program. Navy Shore Facilities Improvement. Advanced Fendering Program. Deep Ocean Technology in support of ASW. Marine Corps Amphibious Logistics. Navy Construction Forces System. Mobile Offshore Basing (MOBS). Sea Based Facility (SBF) Program. Ocean Test Ranges. Shallow Water Test Ranges. Ocean Moorings for Acoustic Surveillance (Std Eiger II Program). Marine Handling Systems for Low Frequency Active Acoustic Surveillance Systems. Undersea Cable Burial and Survivability. Underwater Construction Force Systems. Explosives Safety. Physical Security Systems. DoD LOCKS Program. Naval Environmental Protection Support services. Hazard Abatement. Pollution Abatement Ashore. Environmental Security Technology Certification Program, Environmental Investment, and Strategic Environmental Research and Development Program.

EQUIPMENT/FACILITIES

Deep Ocean Simulation Laboratory. Shallow Water Dive Tank. Research Motor Vessel Independence. Ballistic Advanced Waterfront Technology Test Site. Metallurgical Material Laboratory. Chemistry Laboratory. Water Purification Laboratory. Steamboiler Laboratory. Electromagnetic Pulse Test Facility. Physical Security Test Facility. Soils Laboratory. Heavy Equipment Test Facility. Helo lift test site. High temperature pavements stand.

Deep Ocean Simulation Laboratory - This is the largest facility of its kind on the West Coast. It contains 12 pressure vessels capable of simulating the deep ocean environment under controlled conditions. It is used for certifying fleet hardware and support technology validation and testing.

Shallow Water Dive Tank - A 30-ft diameter, 65,000 gallon seawater tank for testing oceanographic equipment, diver construction techniques, diver tools and underwater non-destructive technical (NDT) equipment.

Motor Vessel Independence - A 200-ft vessel outfitted to support ocean engineering research and undersea equipment validation testing. The Independence has an A-Frame well and crane system for installation and retrieval of underwater systems.

Research Support Vessel (RSV) - A 50-foot nearshore vessel outfitted to support diving operations and oceanographic equipment testing and operations.

Remotely Operated Underwater Vehicle (ROV) - A 2000 foot capable ROV system which includes a PHANTOM vehicle, control van, handling system and experienced operating crew. May be deployed from shore or onboard surface vessels.

EQUIPMENT/FACILITIES (continued)

Advanced Waterfront Technology Test Site (AWTTS) - A half-scale 160' foot test pier with removable deck sections for testing constructability and durability (under constant stress) of waterfront construction and repair materials and systems in a corrosive marine environment. Decks can be statically loaded up to 300,000 lbs. Embedded instrumentation facilitates monitoring performance of structural components. Supports testing programs for the USA CERL, USA WES, Composites Institute and the CERF.

Linear Cable Engine (LCE) - Cable deployment system for 8000 lbs. line pull at a maximum line speed of 500 ft/min.

Environmental Control Systems Fabrication and Test Laboratory - This facility supports breadboard through prototype fabrication and T&E operations. A chemical analytical laboratory for environmental engineering support is contained within the same complex.

High Temperature Pavements Test Facility - Controlled high temperature blast facility, which simulates the jet blast of an aircraft auxiliary power unit. Used to test concrete mixtures from the effects of blasts from F-18s, B-1s and AV-8Bs.

Cable Survivability Test Flume - 100-ft by 50-ft by 3-ft deep salt water tank provides survivability testing of full-sized seafloor cabling in a flowing water environment.

Seawater Test Facility - Test site for development, test and evaluation of seawater desalination equipment and expeditionary water treatment devices for production of potable water.

Crash Fire Rescue Vehicle Test Facility - Controlled performance testing of AFFF delivery systems for crash trucks. Test facility is extensively used by the USAF Vehicle maintenance training School.

Cold Test Chamber - Environmental chamber for testing equipment down to -50 degrees.

Battery Laboratory - This facility supports testing and evaluation of batteries for Deep Submergence Rescue Vehicles under simulated ocean conditions in conjunction with the pressure vessels of the Deep Ocean Simulation Laboratory. Large battery chargers, load banks, cell monitoring voltage scanners and electrolyte handling equipment are used to conduct tests on silver-zinc batteries for the Navy.

Flexor Test Stand - Computer controlled test rig capable of applying cyclical test loads of up to 300,000 lbs. for dynamic barge loading tests of Flexor Pontoon connectors.

Fiber Optics Laboratory - A 2000 sq. ft facility with temperature controlled cleanrooms for preparing glass optical fibers for precision optical measurements.

Geotechnical Modeling Test Facility - The only Navy facility for controlled testing involving dragging of implements through soils at metered rates for monitoring soil behavior. The facility is used for testing model anchors, site assessment tools, cable plows, and other implements for penetrating the seafloor.

Naval Facilities Engineering Service Center

Port Hueneme, CA 93043-4328

(805) 982-1393

Commanding Officer: CAPT Donald G. Morris

Business Mgr.: Robert N. Cordy

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.017	NA	0.000	0.017
6.2	3.899	NA	1.369	5.268
6.3	1.786	NA	4.831	6.617
Subtotal (S&T)	5.702	NA	6.200	11.902
6.4	5.934	NA	5.350	11.284
6.5	0.200	NA	0.000	0.200
6.6	0.109	NA	0.000	0.109
6.7	0.471	NA	0.000	0.471
Non-DOD	2.977	NA	8.049	11.026
TOTAL RDT&E	15.393	NA	19.599	34.992
Procurement	1.911	NA	17.215	19.126
Operations & Maintenance	29.223	NA	43.964	73.187
Other	7.487	NA	25.508	32.995
TOTAL FUNDING	54.014	NA	106.286	160.300

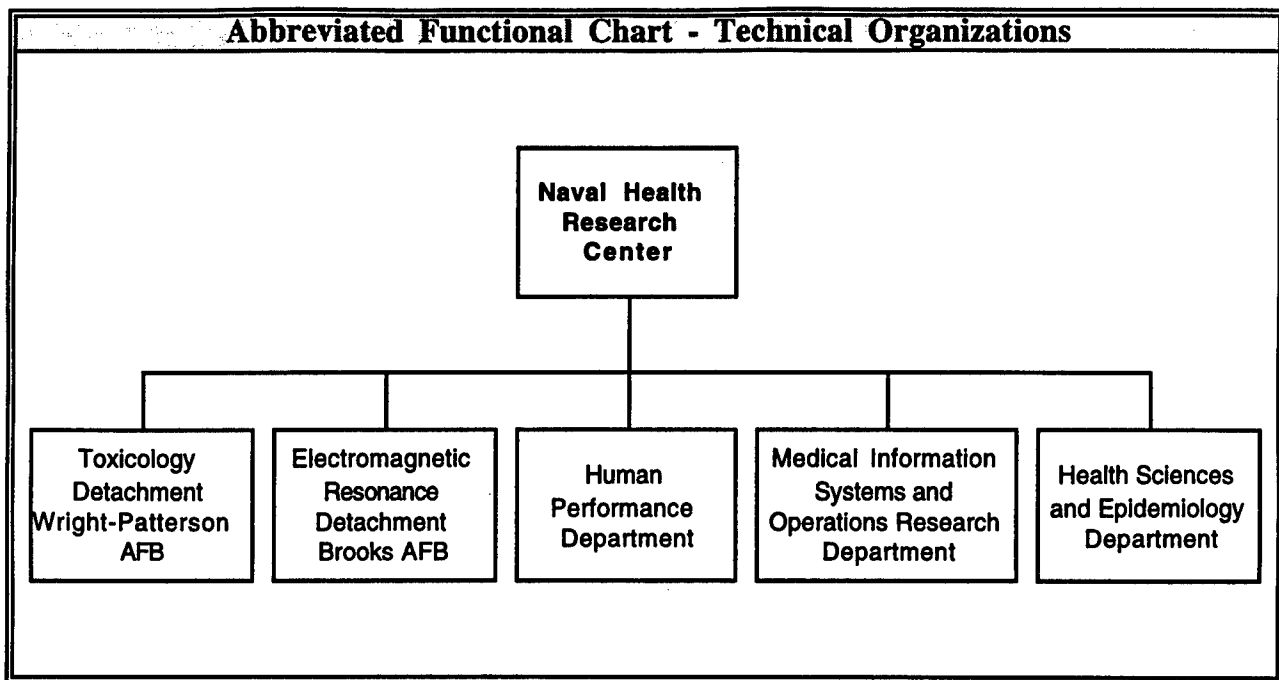
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.912

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	21	21
CIVILIAN	22	327	205	554
TOTAL	22	327	226	575

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	68.000	REAL PROPERTY	30.000
ADMIN	84.000	* NEW CAPITAL EQUIPMENT	0.700
OTHER	35.000	EQUIPMENT	8.700
TOTAL	187.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.700
ACRES	10	* Subset of previous category.	

NA = Not Applicable

Naval Health Research Center



Naval Health Research Center
San Diego, CA 92186-5122
(619) 553-8400

Commanding Officer: CAPT Larry M. Dean
Scientific Dir: Dr. Don Stephen Nice

MISSION

The Mission of the Naval Health Research Center is: To plan, direct and execute research, development, test, and evaluation programs to enhance the operational readiness, health and safety of Navy and Marine Corps personnel.

CURRENT IMPORTANT PROGRAMS

The R&D mission at Naval Health Research Center addresses three programmatic areas. For updated information on all NAVHLTHRSCHCEN programs please visit the Programs/Publications section of our Homepage at: <http://www.nhrc.navy.mil/>

1. Human Performance Department - The smaller force structure, coupled with constantly evolving mission and tactical requirements, makes it imperative that each warfighter be at peak operational readiness. This program focuses on optimizing Navy and Marine Corps operational performance through assessment of personnel performance and quantification of mission stressors that negatively influence mission success. The research includes controlled laboratory studies and studies in which researchers deploy to training locations. These research teams are widely recognized for excellence in conducting research meeting critical Fleet and Corps requirements and insuring rapid technology transfer.

Environmental Extremes - With a worldwide theater of operations, Navy and Marine Corps personnel operate in environments that can substantially degrade performance. This research quantifies the effects of exposure to environmental stressors (e.g., heat, cold, g-forces) and identifies, develops, and evaluates countermeasures to performance degradation. Marine Corps and Naval Special Warfare (SEAL) cold weather operations are a core area of research.

Special Operations - Recognizing the unique requirements of Naval Special Warfare and Marine Corps Special Operations Capable personnel, this program focuses on effectively enhancing mission performance under the most arduous of operational conditions. The program is strongly user oriented, with special operations personnel involved extensively in all steps of the research process.

Protective Equipment Evaluation - Protective equipment designed to safeguard personnel in hazardous environments often places substantial physiological strain on the individual. Understanding the complex interaction of protection from the environment and the resulting impact on physiology and performance is critical to developing interventions that enhance personnel safety and operational capability.

Physical Readiness Standards - This program established the Navy's physical readiness and body fat standards. While work has continued in this area, it has expanded to encompass occupation specific, gender neutral standards that will lead to enhanced operational readiness for Navy and Marine Corps personnel.

Occupational and Exercise-related Injuries - These injuries have a substantial negative impact on manpower availability, cost, and combat readiness. The research focuses on identifying prevalent risk factors for musculoskeletal injury, evaluating the efficacy of rehabilitation modalities, and injury prevention. A new area of investigation incorporates cutting-edge technologies using tissue metabolism markers to predict those at increased risk of injury, thus enhancing personnel safety and reducing the burden on the medical care system.

CURRENT IMPORTANT PROGRAMS (continued)**2. Medical Information Systems & Operations Research Department:**

Medical Decision Support: Systems are developed that integrate information from multiple sources to generate indices and displays for reducing information overload and facilitating rapid responses during crises.

Occupational Health Management: Methods are developed to provide occupational safety and health managers improved capability to plan and execute environmental inspections, better identify high risk conditions, and project the cost of occupational illness and injury.

Theater Medical Information: Systems are designed to capture medical information in an operational theater, compile the information needed to support the continuity of care, project the impact on medical resources, and improve medical situational awareness.

Telemedicine: Information is gathered and analyzed to assess the impact of telecommunication technology on clinical care and medical readiness in remote operational environments.

Medical Readiness Modeling and Simulation: Models and simulations are developed to project patient load in deployed operational environments, to manage the handling of casualties, and to estimate the impact on medical resources.

Operator State Modeling: Psychophysiological (e.g., electroencephalographic, eye tracking) and behavioral data are used to model states of drowsiness and cognitive overload in order to develop real-time cognitive monitoring technologies. These technologies are central to human performance optimization.

Interpersonal Violence: Data related to victimization and perpetration of aggression are collected to develop treatment, prevention, and intervention programs associated with health-care utilization.

3. Health Sciences & Epidemiology Department:

Shipboard Health Studies - Survey data are provided by men and women serving aboard ship. Shipboard Medical Departments provided information regarding sick call visits, availability of supplies, pregnancy rates; reproductive health; stress; lifestyle factors; self-reported occupational exposures; and self-reported health conditions. These programs provide decision support for shipboard health care policy.

Persian Gulf War Unexplained Illness - Currently, 7 research studies of Gulf War veterans and their families are being conducted in the areas of hospitalizations, symptoms, exposures, physical performance, infertility, and pregnancy outcomes.

Global Surveillance for Emerging Illnesses - As the U.S. Navy Node of the DoD Global Surveillance and Response Program for Emerging Illnesses, NHRC is conducting epidemiologic studies of a number of pathogens which cause emerging illnesses. Active surveillance currently includes studies of the epidemiology of *Streptococcus pyogenes*, *Streptococcus pneumoniae*, *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *Bordetella pertussis*, adenovirus, and *Ureaplasma urealyticum*.

Respiratory Disease Epidemiology - This research area focuses on the epidemiology of respiratory disease in military populations, particularly in populations of trainees with a high aggregation of susceptible individuals.

Health Promotion - Addresses the Navy's need to reduce health risks and associated health care costs. Current work focuses on the effectiveness of interventions for weight management, smoking cessation, and alcohol abuse rehabilitation.

CURRENT IMPORTANT PROGRAMS (continued)

Suicide and Mental Illness - NHRC maintains a casualty record database for Navy and Marine Corps suicides since 1983. The primary objective of this research area is to provide epidemiologic information relevant to prevention programs that are targeted to military populations.

Musculoskeletal Overuse Injury Prevention Research - Goals: 1) determination of the operational, fiscal, and personal impact of musculoskeletal injury in training and operational forces; 2) development of predictive profiles for injury susceptibility; and 3) development, implementation and evaluation of interventions to reduce the incidence and negative impact of these injuries.

Alcohol Misuse Prevention Research - Goal: 1) develop a cognitive-behavioral intervention program to reduce heavy drinking among junior Marine Corps personnel and promote responsible attitudes toward alcohol use, with a particular emphasis on behavior during deployments; 2) develop complementary training programs for senior enlisted and officers aimed at deglamourizing alcohol use; and 3) measure the effectiveness of intervention programs using hard outcome measures, as well attitudes and behavioral intentions.

Sexually Transmitted Disease and Unplanned Pregnancy Prevention Research - Develop cognitive skills building interventions to reduce the high-risk behaviors associated with STD acquisition and unplanned pregnancy in operational military populations. This research area includes a program in HIV which is defining the epidemiology of HIV in military populations and includes molecular subtyping of HIV strains to pinpoint likely locations of acquisition of HIV infection.

HIV Central Registry - NHRC maintains the Navy HIV Central Registry, a computerized database devoted to the study of the acquisition of, and clinical course of HIV infection. The HIV Central Registry contains extensive demographic and career history information for all active-duty Navy and Marine Corps personnel tested for HIV.

Epidemiologic Research Database Development - The primary resource for hospitalization studies is the Career History Archival Medical and Personnel System (CHAMPS) Research Database which is a computerized medical (inpatient events) and career history database that provides extensive information for Naval epidemiologic occupational health research. This longitudinal database includes information for Navy enlisted personnel dating back to 1973 and is currently being expanded to include Navy officer and Marine Corps personnel.

EQUIPMENT/FACILITIES**Occupational and Environmental Physiology Laboratory:**

This 8000 square foot facility, built in 1997, provides a unique ability to address operational issues rapidly and, when required, under operational conditions. The state-of-the-art equipment in the laboratory was selected to ensure high mobility and multifunction capability. Enhanced mobility allows researchers to set up temporary, yet fully operational, laboratories on site at Fleet and Marine Corps facilities, both in CONUS and OCONUS. The laboratory's proximity to the West Coast Fleet maximizes technology transfer to the Fleet and Marine Corps operational forces. A satellite laboratory for cold-weather and altitude studies is maintained at the Marine Corps Mountain Warfare Training Center, Bridgeport, CA.

Equipment:

- Thermal physiology: two environmental chambers with temperature ranges of -20° to 180° F; humidity 20-85%, each capable of holding three treadmills for exercise studies; immersion tank allowing whole-body exposure to water between 45° and 110° F.
- Swim flume: one of the worlds largest swim flumes allows studies of immersion in static water or swimming in moving water (up to 4 knots) at temperatures between 45° and 90° F. The proximity of the flume to the environmental chambers allows research on serial wet-dry exposures such as those encountered during special operations or littoral warfare.
- Biomechanics: force plates for motion and ground reaction forces, electromyography, kinesthesiology, electrogoniometry, accelerometry, 3-D motion analysis system.
- Biochemistry laboratory: basic clinical and hormonal chemistries; tissue sample preparation and analyses.
- Body composition: anthropometry, bone densities (dual energy x-ray absorptometry [DEXA]), bioimpedance, hydrodensitometry allow determination of body composition using the four-compartment model.
- Ergometry: treadmills (2 with eccentric [downhill] capability), mechanically- and electrically-braked bicycle ergometers; 7 automated and semiautomated metabolic measurement systems; incremental lifting machine; equilibrium testing; pulmonary function testing; Cybex, Kincom, and Ariel computerized muscle function testing systems.
- Thermal imaging: infrared camera for dynamic measurement of weighted and gradient skin surface temperatures.
- Whole body calorimetry: fluid-based tube suit for measuring heat flux from six body regions to protective ensembles or the environment.

Medical Information Systems & Operations Research Specific Equipment:

- Several Concurrent and Silicon Graphics computer systems form the backbone of the electroencephalographic and electro-oculographic laboratory, currently used for Operator-State Assessment projects. The systems enable multi-channel real-time signal acquisition and subsequent analysis of psychophysiological and behavioral data.
- Two ASL 4000 series video-based eye tracking systems (one remote, one head mounted optics) and an electromagnetic head tracking system.

Health Sciences & Epidemiology Equipment Wet Laboratory capabilities:

Primary focus on specimen preparation, cold storage, packaging, and some limited in-house laboratory analyses. Current laboratory analytic capabilities include: viral culture, with a current focus on identification and typing of adenovirus; culture and performance of antibiotic resistance testing on a variety of bacterial pathogens, including *Streptococcus pyogenes* and *Streptococcus pneumoniae*; serological assays for antibody titers to various pathogens are also performed. - Future laboratory analytic capabilities include use of PCR techniques to expand the scope of viral and bacterial pathogens under study.

Naval Health Research Center
San Diego, CA 92186-5122
(619) 553-8400

Commanding Officer: CAPT Larry M. Dean
Scientific Dir: Dr. Don Stephen Nice

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.025	NA	0.015	0.040
6.2	0.835	NA	0.394	1.229
6.3	2.992	NA	6.326	9.318
Subtotal (S&T)	3.852	NA	6.735	10.587
6.4	0.000	NA	0.000	0.000
6.5	0.083	NA	0.007	0.090
6.6	0.012	NA	0.082	0.094
6.7	0.073	NA	0.025	0.098
Non-DOD	0.107	NA	0.174	0.281
TOTAL RDT&E	4.127	NA	7.023	11.150
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	1.461	NA	1.476	2.937
Other	0.000	NA	0.046	0.046
TOTAL FUNDING	5.588	NA	8.545	14.133

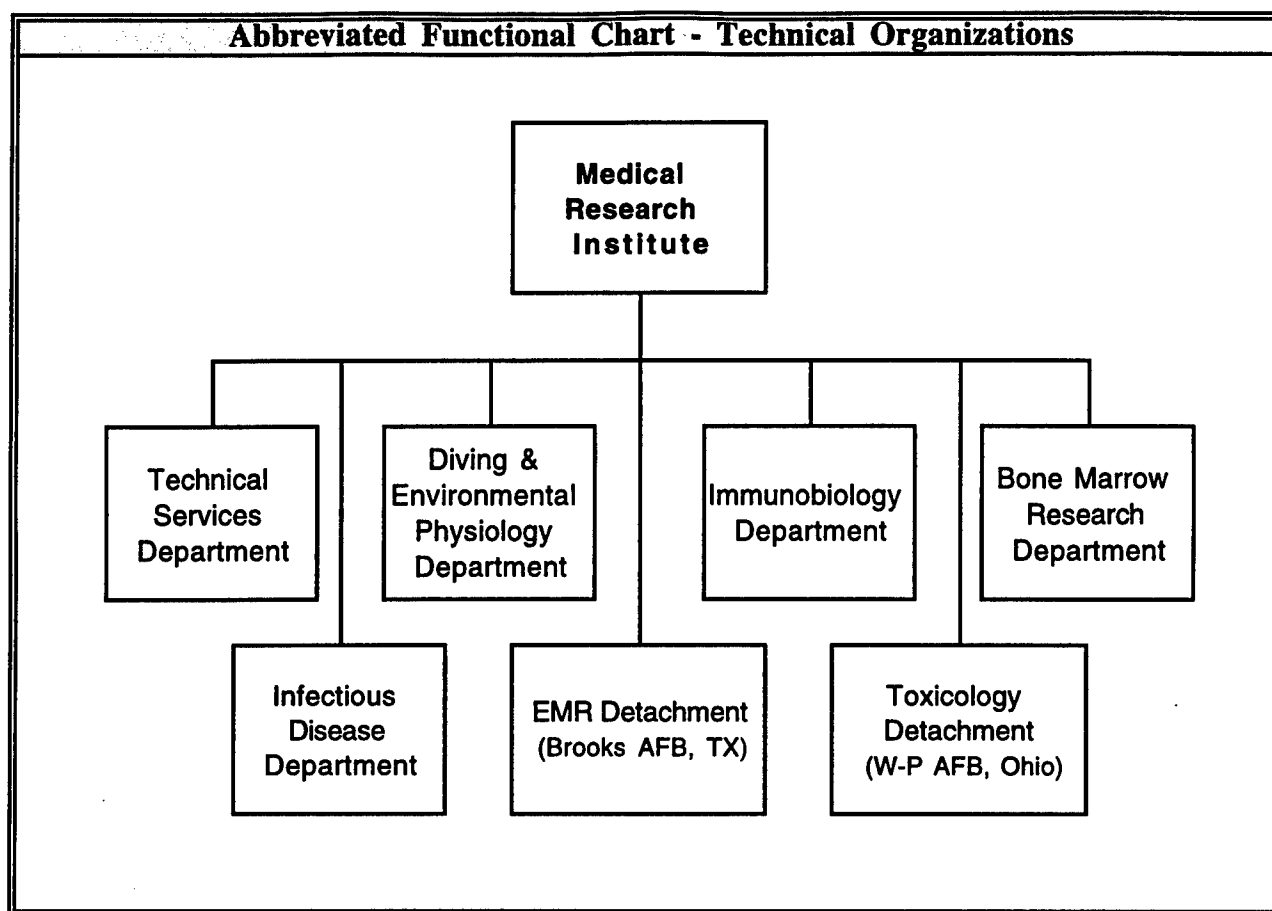
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.387

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	8	3	10	21
CIVILIAN	14	19	25	58
TOTAL	22	22	35	79

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	32.330	REAL PROPERTY	0.000
ADMIN	12.250	* NEW CAPITAL EQUIPMENT	0.000
OTHER	2.200	EQUIPMENT	1.934
TOTAL	46.780	* NEW SCIENTIFIC & ENG. EQUIP.	0.277
ACRES	0	* Subset of previous category.	

NA = Not Applicable

Naval Medical Research Institute



Naval Medical Research Institute
Bethesda, MD 20889-5607
(301) 295-0007

Commander: CAPT Thomas J. Contreras, Jr.
Rsrch Adm: CAPT Christopher Lissner

MISSION

To conduct research, development, tests and evaluations to enhance the health, safety, and readiness of Navy and Marine Corps personnel in the effective performance of peacetime and contingency missions, and to perform such other functions or tasks as may be directed by higher authority.

The specific functions to be accomplished are:

- a. Provide basic and applied research on infectious diseases, tissue transplantation, diving and hyperbaric medicine, casualty care, and environmental medicine and human factors which are directly related to military requirements and operational needs.
- b. Maintain a program of basic biomedical research in areas of military importance to develop knowledge in anticipation of future problems.
- c. Provide the scientific potential for the application of new biomedical knowledge to operational problems.
- d. Provide biomedical research capabilities to support field laboratories, hospitals and other naval activities in problems beyond their scope.
- e. Provide a source of scientific advisors and consultants readily available to operational commands.

CURRENT IMPORTANT PROGRAMS

BONE MARROW RESEARCH DEPARTMENT:

A research leader in the Department of Defense Marrow Donor Program (C. W. Bill Young Marrow Donor Recruitment and Research Program), the Bone Marrow Research Department provides military contingency support for casualties with marrow toxic injury due to radiation or chemical warfare agents. The department performs laboratory research which supports technology innovations to make highly reliable and cost effective DNA-based typing for marrow transplants.

COMBAT CASUALTY CARE DEPARTMENT:

Immune Cell Biology Program: The Immune Cell Biology centers its research efforts upon three basic scientific and clinical applications of immunology, namely a) the development of novel, safe and effective methods to suppress undesired immune responses in organ transplantation, autoimmune disease, and superantigen toxin exposure; b) the development of strategies to enhance immune responses so as to improve defenses against a variety of infectious processes, including HIV; and, c) the development of methodologies that will allow for the ex vivo expansion of bone marrow for use in transplantation of patients with seriously injured marrow. In addition, this last research thrust area focuses upon strategies to generate specific types of blood cells of therapeutic interest.

CURRENT IMPORTANT PROGRAMS (continued)

Transfusion and Cryopreservation Research Program: The Transfusion and Cryopreservation Research Program centers its research efforts upon four scientific research and clinical applications of Cryobiology, namely: a) the development of safe and effective methods of extending the refrigerated storage of red cells, the post-thaw shelf-life of frozen red cells and optimization of a transfusable polymer cryoprotectant; b) the examination of the radical discovery that proteins unfolded in cold do not necessarily reverse to the native state and to assess this effect on function; c) the prevention of phagocytosis of red cells following transfusion which may result from the rapid degeneration of leukocytes following blood collection, the release of cytokines and the development of apoptotic cells which can absorb on red cells and stimulate phagocytosis; and d) the utilization of vitrification instead of freezing for the cryopreservation of tissues as a means of long term storage to achieve surgical reconstruction of traumatic tissue loss.

Resuscitative Medicine Research Program: The Resuscitative Medicine Research Program is focused upon the investigation of mechanisms responsible for cell death during hemorrhage and upon various approaches for pharmacological intervention to improve the survival of personnel who have sustained combat casualties. Program efforts are centered upon four specific research methodological targets: a) the development of treatment regimens for the depression of metabolic rate in both cell cultures and animal models of hemorrhage and ischemia; b) the examination of the involvement of both the vascular endothelium and circulating blood cells in acute inflammatory responses and subsequent cellular injury observed during severe trauma, hemorrhagic shock and ischemia; c) the identification of methods to modulate leukocyte-induced tissue damage triggered by hypoxia/hemorrhage; and, d) the characterization of mechanisms such as hypothermia and hibernation to identify key mechanisms to create low metabolic states to induce resistance to damage and to study mechanisms of natural tolerance to hypoxia.

DIVING AND ENVIRONMENTAL PHYSIOLOGY DEPARTMENT:

Thermal Stress Research Program: The primary objective of the Thermal Stress Program is to develop effective interventions, both physiological and pharmacological, and provide guidelines to minimize the impact of diving and extreme temperature. Recommendations are provided to the operational community to improve both physical and cognitive performance in harsh environments. These recommendations may take the form of pharmacological, nutritive or training interventions.

Decompression Research Program: The primary objective of the Decompression Research Program is to perform basic and applied research that is aimed at finding new ways to accelerate decompression safely after long deep dives, as well as prevent and treat decompression sickness (DCS) in deep sea divers and crewmembers of disabled submarines. The program includes research procedures in decompression, DCS epidemiology and risk prediction, development of gas exchange kinetics and bubble dynamics models, biochemical decompression, DCS pathophysiology, and control of contaminants in confined atmospheres. Direct taskings involve research for the Explosive Ordnance Disposal, Naval Special Warfare, and Fleet Submarine and Diving communities.

Oxygen Toxicity Research Program: The primary objective of the Oxygen Toxicity Research Program targets the etiology of neurological toxicity, resulting in convulsive seizures, by the breathing of pure oxygen under pressure. The Oxygen Toxicity Program seeks to understand the mechanism underlying this toxicity, and thereby to identify methods for prevention of oxygen-induced seizures. The program addresses the problem at various levels, from biochemical to cellular to animal models.

CURRENT IMPORTANT PROGRAMS (continued)**INFECTIOUS DISEASES DEPARTMENT:**

Malaria Research Program: The primary objective of the Malaria Program is to develop vaccines that prevent malaria in military personnel. The Malaria Program is part of the Department of Defense Malaria Vaccine Program, along with the Division of Communicable Diseases and Immunology, Walter Reed Army Institute of Research, and Navy and Army overseas laboratories in Indonesia, Thailand, Kenya, Brazil, and Peru.

Enteric Diseases Research Program: Globally, diarrheal diseases are a major cause of morbidity and mortality. The Enteric Diseases Research Program is composed of 8 distinct and separately funded research projects. However, the program may be viewed as functionally consisting of two principal thrust areas.

These areas are: 1) development of a *Campylobacter* vaccine, and 2) basic research and epidemiology of emerging disease threats (which is currently focused on newly discovered toxic phenotypes of *E. coli*).

Viral and Rickettsial Diseases Research Program: This program focuses primarily on two major diseases of military importance: Dengue Fever and Scrub Typhus. Dengue fever is an important acute viral disease that is widely distributed throughout the tropical and sub-tropical areas of the world. Research efforts concerned with the development of an efficacious vaccine against dengue fever have employed molecular genetic approaches to define the genetic sequences of the virus that are actually responsible for human virulence and to develop "naked" DNA vaccine by expressing subunits of the dengue virus RNA genome as copy DNA for direct inoculation into laboratory animal models. The Scrub Typhus Program is focused on the development of improved diagnostic assays and the characterization of antibiotic resistance.

Infectious Disease Threat Assessment Research Program: The purpose of this program is to systematically acquire and assess infectious disease risk data from research projects and from collaborations with Navy CONUS and OCONUS medical treatment and research facilities for use in operational planning and research prioritization, and to develop prevention and control, diagnostic, and treatment strategies for infectious disease threats worldwide.

Biological Defense Research Program: The objective of the Biologic Defense Research Program is to improve diagnostic assays for the detection of biological and chemical agents during peacetime and wartime. This program has recently designed, developed, and tested a new prototype immuno-chromatographic assay device which enables multiple assays to be performed simultaneously.

Cooperative Research and Development Agreements

The Institute for Genomic Research - The broad intent of the work performed under the auspices of this agreement is to obtain the entire DNA sequence of at least two species of malaria parasites, of the genus *Plasmodium*. The DNA sequences will provide the foundation for the discovery of new antimalarial drugs, vaccines, and diagnostics, and for greater elucidation of the biology of malaria parasites.

Genelabs - Specialized work on sera of hepatitis patients.

Indx - Serological testing on Dengue patients.

MicroCarb, Inc. (Antex) - Large-scale production of a safe and effective vaccine for the prevention of diarrhea caused by the enteropathogenic *Campylobacter* in humans.

CURRENT IMPORTANT PROGRAMS (continued)

SmithKline Beecham Corp. - Research, development and commercialization of a genetically engineered bacterial toxin, LT-R192G, for use as a safe and efficacious mucosal adjuvant (immune enhancer) to be administered with oral vaccines.

SmithKline Beecham Corp. - Development of chimeric and humanized anti-bodies useful for the prevention of malaria.

Cel-Sci Corporation - The Naval Medical Research Institute and Cel-Sci Corporation are sharing equipment and facilities to facilitate collaborative research partnerships and enhance the research capabilities of each organization. The broad intent of the work performed under the auspices of this Agreement is to develop and test heteroconjugate peptide-based Plasmodium vaccines which contain B or T cell epitopes of the Plasmodium yoelii circumsporozoite protein (CSP) or sporozoite surface protein 2 (SSP2) and T cell binding ligands. These vaccines will be tested for their efficacy in the prevention of sporozoite induced malaria. The active collaboration of staff from both organizations will allow for accelerated development and execution of various Research Projects. Utilizing this model of collaboration and cooperation, research efforts at both organizations will be less costly resulting in increased productivity with less fiscal support.

The University of Illinois - The purpose of this agreement is to investigate the interactions of human and nonhuman primate hematopoietic stem cells (HSC) with porcine brain microvascular endothelial cells (PMVECs). The proposed studies will evaluate the expansion and self-renewal potential of hematopoietic stem cells from normal and diseased subjects with the ultimate goal of fundamentally improving gene marking and gene therapy protocols. In addition, the PMVEC hematopoietic supportive microenvironment will be characterized in regard to adhesion and/or contact-mediated interactions.

Chembio Diagnostic Systems, Inc - Scrub typhus is an acute, febrile disease caused by infection with Orientia (formerly Rickettsia) tsutsugamush. It accounts for up to 23% of all fever in endemic regions of Asia-Pacific. NMRI is involved in the technology development on the diagnosis, threat assessment and treatment of rickettsial diseases. CHEMBIO has developed the capability to produce simple, rapid, highly sensitive and specific diagnostic tests using a variety of antigens. Working together this CRADA hopes to develop rapid serological diagnostic tests including detection of specific IgM antibody and total immunoglobulin against rickettsiae.

Biogen - Both partners wish to develop therapies to specifically prevent the rejection of organs or tissues transplanted from one individual to another. The partners agree that the ideal therapy should be safe, durable, and specific (that is, immune responses other than those directed against the transplant should be left intact). For the joint effort, the ICBP brings experience and scientific expertise in molecular and cellular immunology, and in animal models including primate transplant models. BIOGEN's participation is to provide sufficient quantities of an agent that modulates the function of the cell surface receptor pair called CD40: CD40L, and to provide partial financial support for the primate transplant studies planned. BIOGEN also contributes manufacturing capability to produce drug of the highest (known as good manufacturing practice or GMP) quality, and expertise in both the conduct of human clinical trials and in marketing.

CpG Immunopharmaceuticals Incorporated - The intent of this cooperative agreement is to develop and test the clinical application of oligonucleotide sequences for enhancement of immunogenicity and efficacy of anti-malarial vaccines for the prevention of malaria. Proprietary oligonucleotides that have been identified, engineered and developed as potent pharmacological immune modulators by CpG Inc. will be provided to the Malaria Program at the Naval Medical Research Institute for use in malaria vaccine development. The joint cooperative effort between CpG Inc. and the Naval Medical Research Institute constitutes a major commitment by both parties to advance anti-malarial vaccines for human use by combining CpG oligonucleotide based immune modulation and advanced DNA and/or protein based vaccinology.

CURRENT IMPORTANT PROGRAMS (continued)

Biosource Technologies - NMRI/ICPB has developed a novel patented porcine microvascular endothelial cell line growth medium to expand human stem cells. Biosources Technologies, Inc. will utilize its capabilities to work with NMRI/ICPB isolating and identifying the specific peptide(s) responsible for the unique growth factor properties of the growth medium.

Corixa - The Parties intend to collaborate in the evaluation of LeIF, a novel adjuvant from Corixa Corporation, for potential efficacy as a component of malaria vaccines. Malaria vaccines will include synthetic peptide vaccines; recombinant protein vaccines; and DNA vaccines. In joint studies the NMRI Malaria Program and Corixa Corporation will utilize purified LeIF recombinant protein formulations as well as LeIF encoding DNA together with Plasmodium yoelii antigens or antigen encoding genes (DNA vaccines) to immunize various strains of mice. Specific cellular and humoral immunological responses will be evaluated and the animals will be challenged with parasites to determine protective efficacy. If shown to be efficacious as an adjuvant of P. yoelii vaccines in mice, LeIF will be further assessed as an adjuvant for Plasmodium vaccines in nonhuman primates. Various routes of immunization, immunization schedules and mixtures of antigens will be studied to optimize protective immunity with LeIF as a adjuvant. If successful these preclinical experiments will lead to collaborative efforts by the Parties to prepare and test candidate vaccines with LeIF adjuvant in human subjects, eventually leading to the submission of appropriate documentation to the FDA seeking approval to market such a malaria vaccine.

Nextran - Both partners wish to develop therapies to specifically prevent the rejection of organs or tissues transplanted from pigs into man. The partners agree that the ideal therapy should be safe, durable, and specific (that is, immune responses other than those directed against the transplant should be left intact) and that donor organs should be manipulated when possible to avoid immune attack by the recipient. For the joint effort, the ICBP brings access to several agents which modulate the function of cell surface receptor pairs called CD28: B7 (B7 has two discrete members called CD80 and CD86), and CTLA4 (or CD152): B7. In addition access to hu-5C8, a monoclonal antibody directed toward CD40 ligand (CD154) will be provided. This is provided through a separate CRADA between the NMRI and the BIOGEN Corporation, the sole owner of hu-5C8, specifically allowing the ICBP to participate in pre-clinical trials in xenotransplantation. The ICBP also brings experience and scientific expertise in molecular and cellular immunology, and in animal models including porcine to primate transplant models. Further the ICBP brings experience and expertise in clinical organ transplantation. NEXTRAN's participation is to provide sufficient access to pigs genetically engineered to express one or more human transgenes felt to be important in protecting the organ against hyperacute discordant xenograft rejection. These animals are to serve as donors for transplantation and transplant related studies. NEXTRAN also brings expertise in histological evaluation of transgene expression and evaluation of xeno-specific immune responses. NEXTRAN will also provide partial financial support for the expensive primate transplant studies planned.

University of Kentucky Research Foundation - Acute lung injury (ALI) and its most severe progressive form Acute Respiratory Distress Syndrome (ARDS - collectively ALI/ARDS) often results from the inhalation of smoke and combustion byproducts. Since it's initial recognition as a distinctive lung disease in 1967 important discoveries have been made about the causes and development of ALI/ARDS; however, a great deal of additional research is still necessary to determine risk factors and to develop improved methods to assess novel treatment regimens for this continuum of lung diseases. NMRI/TD and UKRF each have specialized research capabilities which when combined could make significant strides toward satisfying some of these research requirements.

Dyad Pharmaceuticals - It is the goal of this CRADA to design and investigate the protective effects of antisense molecules against the inflammation associated with septic shock and inflammatory diseases in animals, cell cultures, and human subjects with the results and processes made available for public use.

CURRENT IMPORTANT PROGRAMS (continued)

OraVax, Inc. - Research and development of a native labile toxin and a mutant recombinant toxin as adjuvants for a H. pylori vaccine in humans.

Integrated Diagnostics Inc. - Serological test for pathogens of Dengue.

Vical, Inc. - Evaluation of novel vaccine approaches for prevention of malaria using genetic material encoding malarial protein antigens.

Entremed - Development and testing of DNA-based Plasmodium vaccines.

Organ, Inc. - Cryopreservation.

EQUIPMENT/FACILITIES

Complex of 7 buildings (1 off site) containing approximately 160,000 square feet of laboratories.

The laboratory includes the following specialized facilities or equipment:

1. **Man-rated, Deep-dive Hyperbaric Research Chamber Complex:** A DOD unique diving medical research chamber capable of reaching simulated depths of 300 meters, with full research quality level support systems, and composed of 5 separate, interconnected chambers, one with wet-pot capability.
2. **Large Animal Hydrogen Diving Chamber:** A DOD unique chamber capable of accommodating large animals and using Hydrogen/Oxygen gas mixtures. Designed for use in the study of novel enzymatic decompression techniques.
3. **Emergency Hyperbaric Treatment Chamber:** Special chamber designed for treatment of hyperbaric injuries or other clinical hyperbaric treatments.
4. **Scanning Transmission Electron Microscope:** Standard research quality instrument approximately 10 years old.
5. **Fluorescence Cytometers:** Three fully capable instruments, two with double laser capability, one with triple beam capability.
6. **Digital Imaging System.**

Naval Medical Research Institute
Bethesda, MD 20889-5607
(301) 295-0007

Commander: CAPT Thomas J. Contreras, Jr.
Rsrch Adm: CAPT Christopher Lissner

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	1.846	NA	0.713	2.559
6.2	1.324	NA	1.442	2.766
6.3	6.511	NA	1.740	8.251
Subtotal (S&T)	9.681	NA	3.895	13.576
6.4	0.411	NA	0.094	0.505
6.5	0.000	NA	0.000	0.000
6.6	1.433	NA	0.000	1.433
6.7	0.000	NA	0.000	0.000
Non-DOD	0.739	NA	0.618	1.357
TOTAL RDT&E	12.264	NA	4.607	16.871
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.000	NA	0.000	0.000
Other	9.145	NA	6.812	15.957
TOTAL FUNDING	21.409	NA	11.419	32.828

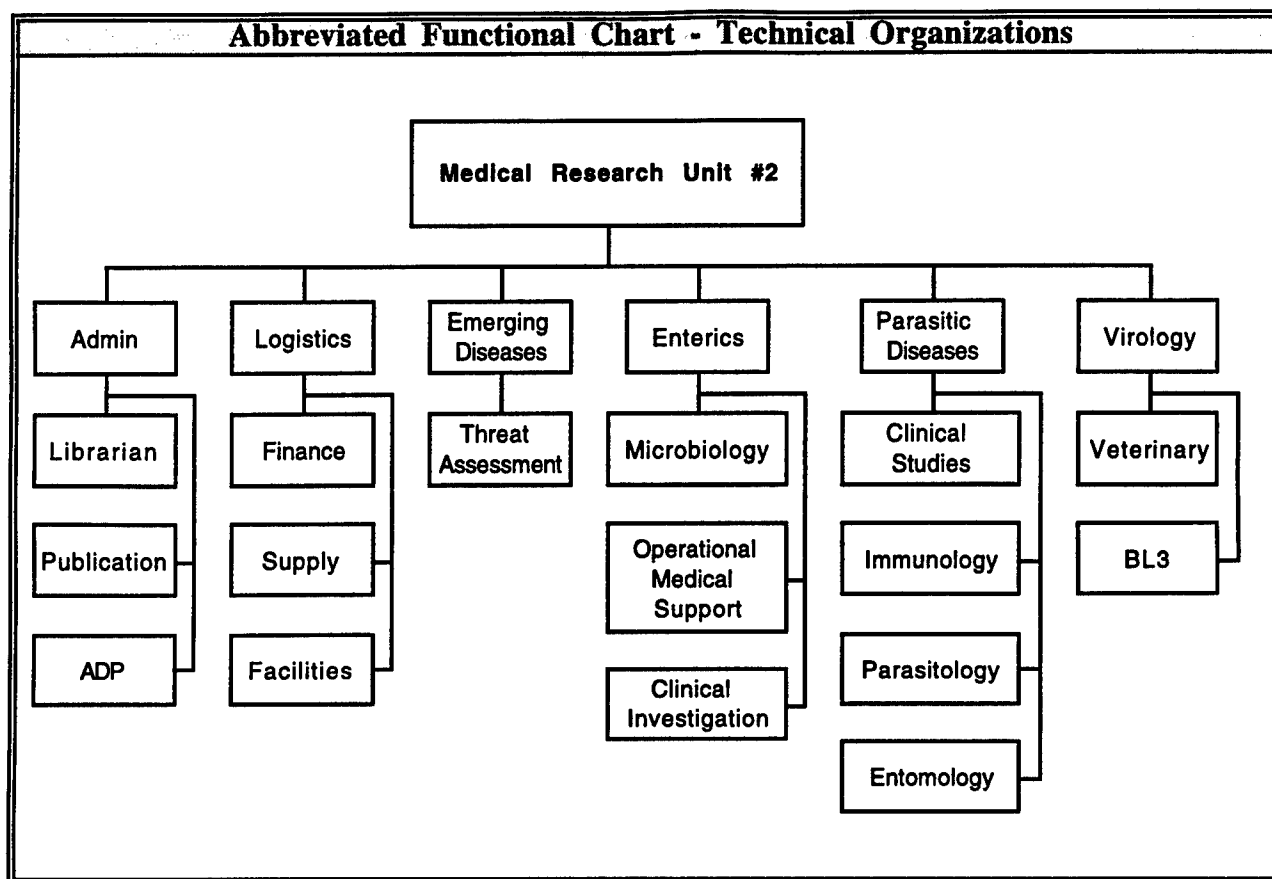
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	59	68	74	201
CIVILIAN	26	76	46	148
TOTAL	85	144	120	349

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	161.930	REAL PROPERTY	8.700
ADMIN	63.875	* NEW CAPITAL EQUIPMENT	0.550
OTHER	0.000	EQUIPMENT	22.620
TOTAL	225.805	* NEW SCIENTIFIC & ENG. EQUIP.	0.620
ACRES	7	* Subset of previous category.	

NA = Not Applicable

Naval Medical Research Unit # 2



Naval Medical Research Unit # 2
Jakarta, Indonesia, APO AP 96520-8132
(62) 421-4452

Commanding Officer: CAPT H.V. Peterson, MSC
Exec. Officer: CDR J.P. Burans, MSC

MISSION

The U.S. Naval Medical Research Unit No.2 (NAMRU-2) is a Department of Defense infectious Diseases laboratory located on the grounds of the Indonesian National Institutes of Health Research and Development in downtown Jakarta. Its Mission is to study infectious diseases of mission aborting potential in Southeast Asia and to assist host government health agencies with infectious diseases problems of mutual interest. NAMRU-2 is also part of the Department of Defense (DOD) Global Surveillance Program and has recently been designated the Southeast Asia Regional Collaborating Center for Emerging Diseases by the World Health Organization (WHO). The Unit has been in Asia since 1942 having moved from Guam to Taiwan and subsequently to the Philippines and Indonesia where it has operated since 1970. NAMRU-2 serves the United States military by providing an environment for the study of tropical diseases of importance to both military and civilian populations. Of particular emphasis, both historically and currently, are studies of malaria, cholera, typhoid fever, dengue fever, severe diarrhea, viral hepatitis, HIV and Japanese encephalitis. Noteworthy contributions include the pioneering work for development of oral rehydration therapy that prevents death due to water loss in severe diarrheal diseases like cholera, the identification and characterization of hepatitis B in Asia and the demonstration by NAMRU-2 scientists and their Indonesian colleagues of the efficacy of the current oral typhoid vaccine. NAMRU-2 has also been in the forefront of the discovery and surveillance of the spread of drug resistant malaria parasites and emerging diseases. CAPT Henrik V. Petersen, MSC, USN is the current Commanding Officer of the Unit which is staffed by 14 military officers, five enlisted members, one civilian Scientific Director, one civilian investigator, and 92 Foreign Service National (FSN) staff.

CURRENT IMPORTANT PROGRAMS

The research institute is composed of scientific research programs which include the; Emerging Diseases Program, Viral Diseases Program, Parasitic Diseases Program, Bacterial Disease Program and Administrative and Logistical Support. These scientific programs have state of the art equipment to support the numerous ongoing infectious disease research projects at NAMRU-2.

The Emerging Diseases Program conducts field studies throughout the Indonesian archipelago and other countries in Southeast Asia such as Vietnam, Laos and Cambodia. The efforts of this program are primarily focused on surveillance for new, emerging and re-emerging infectious diseases using NAMRU-2's extensive infectious disease diagnostic and epidemiological capabilities.

The Parasitic Diseases Program is primarily focused on basic and applied research on malaria. Research efforts include: evaluation of new diagnostic assays, evaluation of new prophylactic and therapeutic drugs, characterization of the immune response to malaria infections to facilitate the development of potential vaccines for malaria and development and characterization of field sites for new malaria vaccine evaluations. This program utilizes sophisticated equipment such as a flow cytometer, DNA sequencer and DNA thermocyclers to conduct basic immunology and molecular biology studies of malaria. The program also has an extensive entomology capability which includes the in house breeding of mosquitoes.

The Bacterial Diseases Programs conducts research to; determine the causes of acute diarrheal disease in Southeast Asia, evaluate vaccines for cholera and to support emerging disease surveillance with a comprehensive diagnostic medical microbiology capability which includes sophisticated equipment and reagents necessary for the biomolecular identification and characterization of microbial pathogens.

The Viral Diseases Program conducts research on the molecular biology and epidemiology of HIV and several viral diseases such as Dengue. The program supports NAMRU-2's emerging disease surveillance efforts with extensive diagnostic capabilities for the isolation and identification of human viral pathogens. The Viral Diseases Program also includes a modular Biosafety Level 3 Containment Laboratory which when fully operational will exceed all current requirements for work with Biosafety Level 3 pathogens. This laboratory is the only one of its kind in Southeast Asia and will allow NAMRU-2 personnel and Indonesian collaborators to work safely with samples potentially containing BSL-3 agents.

EQUIPMENT/FACILITIES

Background: Naval Medical Research Unit No 2 (NAMRU-2) and its satellite lab component in Jayapura, Irian Jaya has conducted infectious disease research throughout the Indonesian archipelago and in other areas of Southeast Asia for over 30 years. NAMRU-2 is located in Jakarta, Indonesia on the compound of the National Institutes of Health (LITBANGKES), Indonesian Ministry of Health. The research unit has a staff of 19 military, 2 civilian and 92 Foreign Service National (FSN) scientific, technical and support staff. Research laboratories, administrative offices and logistical support spaces are integrated into buildings owned by the Indonesian Ministry of Health. NAMRU-2 currently has 16.4 k sq ft of laboratories, 11.4 k sq ft of administrative offices and 31.0 k sq ft of logistical support spaces.

The administrative and logistical support components provide: administrative oversight and personnel support, contracting, disbursing, purchasing, warehousing, transportation, facilities maintenance, medical repair, veterinary services, automated data processing, publication services, library services and American staff housing support. In order to provide these administrative and logistical support services NAMRU-2 has and maintains an animal facility, scientific library, computer network, in house maintenance facility, motorpool (includes vehicles for home to work transportation and logistical support) and facility electrical backup (5 diesel generators with total of 1,170 KW)

NAMRU-2's field laboratory in Jayapura, Irian Jaya, which is 4,500 Km from Jakarta, is used to support malaria and other important infectious diseases studies being conducted in more remote areas of Irian Jaya. The Jayapura laboratory has 4.5 k sq ft of lab space, a guest house, electrical generator backup and a vehicles use for transportation to remote field sites. related laboratory assays and also to process research specimens for shipment to the Jakarta lab.

Naval Medical Research Unit # 2
 Jakarta, Indonesia, APO AP 96520-8132
 (62) 421-4452

Commanding Officer: CAPT H.V. Peterson, MSC
 Exec. Officer: CDR J.P. Burans, MSC

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.292	NA	0.036	0.328
6.2	0.526	NA	0.012	0.538
6.3	0.444	NA	0.000	0.444
Subtotal (S&T)	1.262	NA	0.048	1.310
6.4	0.000	NA	0.000	0.000
6.5	0.000	NA	0.000	0.000
6.6	2.055	NA	0.000	2.055
6.7	0.000	NA	0.000	0.000
Non-DOD	0.174	NA	0.000	0.174
TOTAL RDT&E	3.491	NA	0.048	3.539
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.000	NA	0.000	0.000
Other	1.688	NA	0.030	1.718
TOTAL FUNDING	5.179	NA	0.078	5.257

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

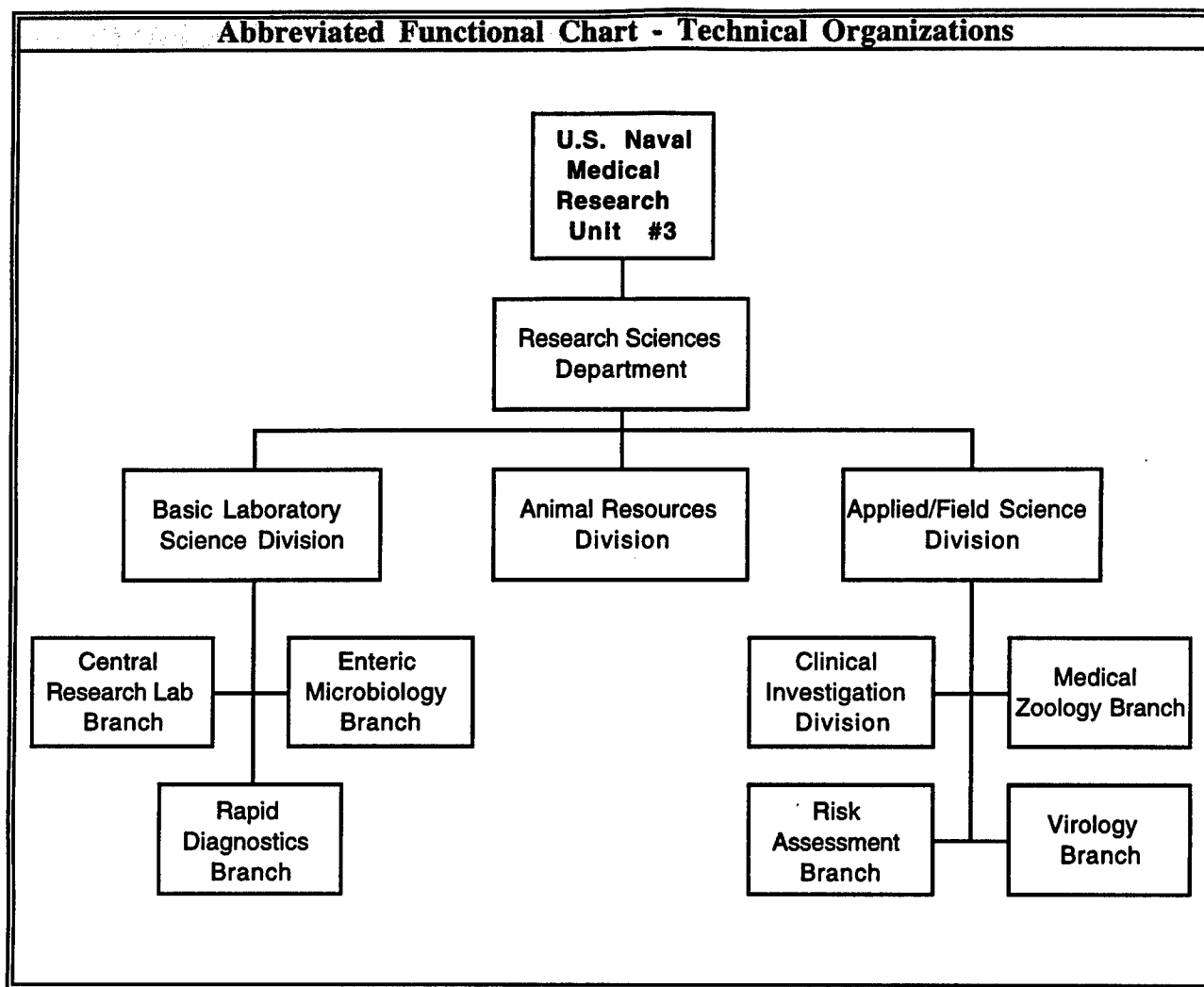
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	9	5	5	19
CIVILIAN	2	52	40	94
TOTAL	11	57	45	113

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	15.132	REAL PROPERTY	2.086
ADMIN	11.797	* NEW CAPITAL EQUIPMENT	0.000
OTHER	22.330	EQUIPMENT	2.175
TOTAL	49.259	* NEW SCIENTIFIC & ENG. EQUIP.	0.185
ACRES	0	* Subset of previous category.	

NA = Not Applicable

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Naval Medical Research Unit # 3



Naval Medical Research Unit # 3
Cairo, Egypt, FPO AE 09835-0007
(202) 284-1381

Commander: CAPT. Alfred J. Mateczun
Head, RSD: CDR Eileen D. Villasante

MISSION

To conduct research to enhance the health, safety and readiness of Department of Defense personnel assigned to Southwest Asia and Africa in the performance of peacetime and contingency missions, and to perform other such functions as may be directed by higher authority.

Conduct infectious disease (ID) surveillance and response activities.

Conduct interactive ID research with other DoD medical R&D laboratories, specifically in the areas of preventive medicine, epidemiology and tropical medicine.

Develop and maintain the capability to provide ID risk assessment information and conduct research and development to improve prevention, diagnosis, and treatment of ID in the Fleet and Fleet Marine Force.

Maintain a technology base and scientific and technical expertise in infectious diseases and tropical medicine to provide advisory assistance when requested.

CURRENT IMPORTANT PROGRAMS

Epidemiological studies of regionally important enteropathogens.

Enterotoxigenic E. coli vaccine trials in Egyptian populations.

Evaluation of diarrhea prophylaxis drug in U.S. operational forces.

Population-based cohort study on the epidemiology of Helicobacter pylori.

Isolation and characterization of viral threat agents.

Description of epidemiology and identification of associated risk factors of viral disease.

Development of vaccine test sites for enteropathogens and viruses.

Identification and description of regional insect vectors of infectious diseases and their distribution.

Evaluation of insect control measures (i.e., repellents).

Development of malaria field site for epidemiological studies, drug trials and vaccine testing.

EQUIPMENT/FACILITIES

The equipment and resources at NAMRU-3 make it competitive with any major research laboratory in the United States.

BIOMEDICAL RESEARCH SCIENCE BUILDING:

Six story state-of-the-art building completed in 1983. Clinical and Applied Research Laboratory. 2,750 sq ft Biosafety Level-3 Laboratory. Backup emergency generators and modern ventilation and waste disposal design.

LIBRARY:

Heavily used by local scientists/physicians as well as NAMRU-3 staff. Subscriptions to over 75 scientific journals. Houses over 7,000 books.

INSECTARY:

Supports colonies of disease vectors such as ticks, mosquitoes and sand flies.

ANIMAL FACILITY:

Directed by U.S. Army Veterinarian and enlisted (91T) Veterinary Technician. AAALAC-International accredited state-of-the-art animal facility houses rodents, sheep, rabbits and pigeons; barrier facility for breeding inbred mouse strains.

PUBLIC WORKS FACILITY:

Directed by U.S. Navy Civil Engineering Corps Officer. Responsible for engineering, maintenance, construction, design, transportation. Shops: automotive, electrical, mechanical, sheet metal, carpentry, paint and plumbing.

OTHER SUPPORT FACILITIES:

Administration, Finance, Supply, Public Works, Pharmacy, Medical Equipment Repair, Safety, Occupational Health, Computer and Post Office.

ACCESS TO ABBASSIA FEVER HOSPITAL:

Largest Ministry of Health infectious disease hospital in Egypt with 1,500 beds adjacent to NAMRU-3. NAMRU-3 conducts studies in the following wards: Fever of Unknown Origin (FUO), Enteric Fever and Meningitis.

Naval Medical Research Unit # 3
Cairo, Egypt, FPO AE 09835-0007
(202) 284-1381

Commander: CAPT. Alfred J. Mateczun
Head, RSD: CDR Eileen D. Villasante

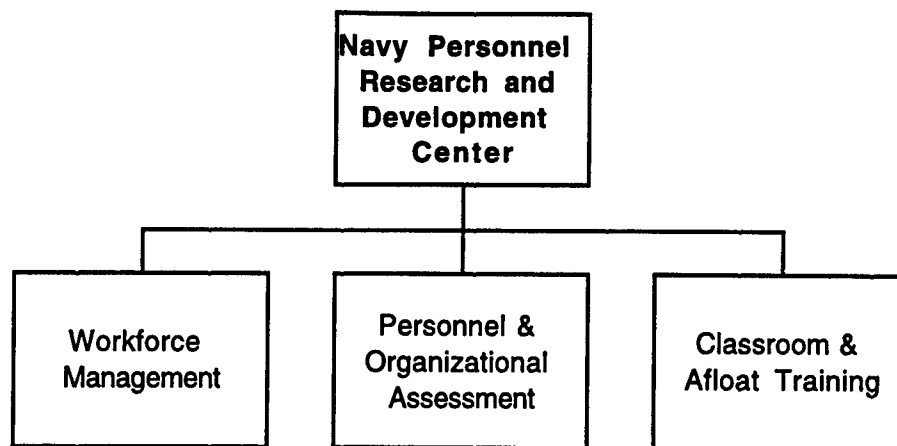
FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.195	NA	0.000	0.195
6.2	0.912	NA	0.000	0.912
6.3	0.336	NA	0.000	0.336
Subtotal (S&T)	1.443	NA	0.000	1.443
6.4	0.480	NA	0.000	0.480
6.5	0.000	NA	0.000	0.000
6.6	3.461	NA	0.000	3.461
6.7	0.000	NA	0.000	0.000
Non-DOD	0.437	NA	0.000	0.437
TOTAL RDT&E	5.821	NA	0.000	5.821
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	1.369	NA	0.000	1.369
Other	0.122	NA	0.000	0.122
TOTAL FUNDING	7.312	NA	0.000	7.312

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	8	11	18	37
CIVILIAN	20	13	135	168
TOTAL	28	24	153	205

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	68.200	REAL PROPERTY	10.600
ADMIN	9.100	* NEW CAPITAL EQUIPMENT	0.000
OTHER	71.300	EQUIPMENT	5.000
TOTAL	148.600	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	4	* Subset of previous category.	

NA = Not Applicable

Navy Personnel Research and Development Center**Abbreviated Functional Chart - Technical Organizations**

Navy Personnel Research and Development Center
San Diego, CA 92152-7250
(619) 553-7812

CO: CDR William M. Keeney
Technical Dir: Mr. Murray W. Rowe

MISSION

NPRDC serves as the Navy's principal research laboratory for developing Manpower, Personnel and Training (MPT) technologies. We maintain and enhance fleet readiness by developing state-of-the-art technology solutions to significant operational problems in Workforce Management, Personnel and Organizational Assessment, and Classroom and Afloat Training. The Center's expertise also encompasses personnel surveys, multicultural and gender research, quality of life issues, productivity enhancement, and drug abuse research.

CURRENT IMPORTANT PROGRAMS

WORKFORCE MANAGEMENT - A comprehensive program to improve the Navy's management of its personnel resources. Products include suites of integrated, computer-based models, databases and systems which enable: Rapidly collecting and displaying information on personnel force characteristics in easily understood graphic and tabular forms; Testing the effects of alternative policies on the workforce by mathematically simulating force dynamics under varying test policies; Developing and updating manning plans to reflect budgetary and end-strength constraints, and statistically forecasting losses and gains at several levels of detail within the enlisted and officer workforce.

Major projects include the Enlisted Strength Planning System, which enables monitoring all personnel force transactions on a daily basis; the Navy Training Reservation System (NTRS), designed to improve the way students are scheduled for Navy schools, while cutting times lost while students transition to and from schools; a Job Advertisement and Selection System (JASS), an on line information and decision system for both sailors and detailers; and Computer-Based Technology for Detailers, which (1) optimally matches rotating sailors to available jobs while considering moving costs, (2) meets sailors' location preferences, and (3) enables maximum use and reuse of individual skills. The department also provides R&D support for the Navy Drug and Alcohol Prevention Program, with tasks addressing detection, prevention, education and substance abuse modeling.

PERSONNEL AND ORGANIZATIONAL ASSESSMENT - The goal of the overall research program is to enhance both personnel and organizational readiness. Efforts in Personnel Assessment address enlisted and officer selection, personnel testing, job classification, and performance measurement. The Center has a strong program to improve the sensitivity and effectiveness of computer adaptive testing in general. Innovative measurement technologies, including computer-based dynamic measures, are also being explored for their usefulness in personnel assessment.

Organizational Assessment investigates and develops organizational solutions to meet Navy goals. Research projects focus on organizational and workgroup behavior. Major projects involve personnel surveys and attitude assessment, multicultural and gender integration, the role of quality of life factors in relation to readiness, and technical innovations to enhance workgroup productivity.

CLASSROOM AND AFLOAT TRAINING - A broad training and education research program that incorporates advanced instructional and computer-based training technologies to create new and better ways to teach complex warfighting skills. The goals of this program are to reduce the costs of initial skills training as well as costs of maintaining highly perishable but infrequently practiced job skills.

CURRENT IMPORTANT PROGRAMS (continued)

This broad-based research program explores the use of multimedia technologies to develop automated classrooms, applications of video teletraining to deliver training worldwide, and the use of high fidelity simulations of complex physical systems to enhance training effectiveness.

One major thrust area involves the application of "intelligent", knowledge-based training systems to improve the effectiveness of technical skills training. These PC-based training systems provide feedback as students progress through the instructional modules, providing expert guidance on courses of action to be taken.

A 1997 new start exploits multimedia approaches to deliver educational, preventive messages on core values concepts, leadership and substance abuse. Pilot-testing is underway at the Recruit Training Command, Great Lakes, Illinois.

BRAC REALIGNMENT - Per BRAC 95, NPRDC's Classroom and Afloat Training research program will transfer to the Naval Air Warfare Center, Training Systems Division on 1 February 1998. Similarly, NPRDC's Workforce Management and Personnel and Organizational Assessment research programs will realign into the Navy Personnel Command, Memphis in October, 1999 becoming the Research, Studies and Technology Department. Upon completion of the Memphis transfer, NPRDC will be disestablished.

EQUIPMENT/FACILITIES

The Center occupies approximately 63,100 square feet of space in converted World War II barracks buildings. Much of this is configured to accommodate the social science and mathematical analysis tasks performed on microcomputers and minicomputers. The facilities include upgraded electrical capability and air conditioning of the most equipment-intensive rooms. In addition, there are two facilities which contain computer rooms with raised flooring, central air conditioning, and upgraded electrical power, both components of the Center Research Computing Facility (RCF):

One installation occupies 2000 square feet and houses an IBM 4381 mainframe computer facility. It is used to develop, process, and maintain statistical and forecasting systems; very large complex personnel and training databases, and large software system applications.

A separate Sun Systems facility, operating under the UNIX operating system occupies 1600 square feet. It provides network (internal and external) services, data analysis software, text processing support, graphics/video image processing software, and electronic mail/news services. The data analysis, text processing, and graphics/video image processing software is specialized and, in some cases, custom written for NPRDC applications. Some of the RCF services required modifications to the UNIX operating system kernel, necessitating an NPRDC source license for the UNIX operating system.

Navy Personnel Research and Development Center
 San Diego, CA 92152-7250
 (619) 553-7812

CO: CDR William M. Keeney
 Technical Dir: Mr. Murray W. Rowe

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.151	NA	NA	0.151
6.1 Other	0.021	NA	0.005	0.026
6.2	2.568	NA	0.915	3.483
6.3	3.027	NA	5.476	8.503
Subtotal (S&T)	5.767	NA	6.396	12.163
6.4	0.000	NA	0.000	0.000
6.5	0.369	NA	0.386	0.755
6.6	0.250	NA	0.622	0.872
6.7	0.000	NA	0.000	0.000
Non-DOD	0.000	NA	0.000	0.000
TOTAL RDT&E	6.386	NA	7.404	13.790
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	2.371	NA	5.247	7.618
Other	0.302	NA	0.263	0.565
TOTAL FUNDING	9.059	NA	12.914	21.973

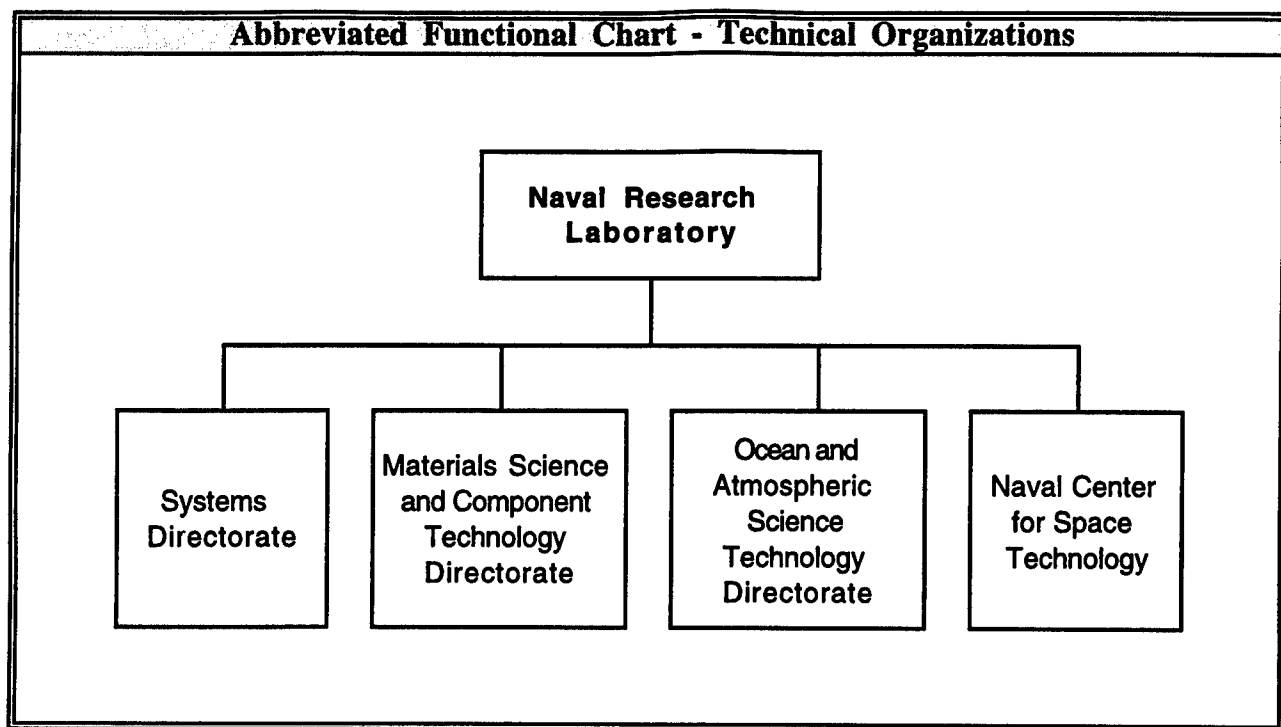
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	6	8	14
CIVILIAN	29	53	34	116
TOTAL	29	59	42	130

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	42.200	REAL PROPERTY	1.147
ADMIN	16.400	* NEW CAPITAL EQUIPMENT	0.000
OTHER	4.500	EQUIPMENT	5.133
TOTAL	63.100	* NEW SCIENTIFIC & ENG. EQUIP.	0.399
ACRES	3	* Subset of previous category.	

NA = Not Applicable

Naval Research Laboratory



Naval Research Laboratory
Washington, D.C. 20375-5320
(202) 767-2541

Commanding Officer: CAPT Bruce W. Buckley
Dir of Research: Dr. Timothy P. Coffey

MISSION

Operate as the Navy's full spectrum corporate laboratory. To conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems and ocean, atmospheric, and space sciences and related technologies. In fulfillment of this mission, the Naval Research Laboratory:

- (1) Initiates and conducts broad scientific research of a basic and long-range nature in scientific areas of interest to the Navy.
- (2) Conducts exploratory and advanced technological development deriving from or appropriate to the scientific program areas.
- (3) Within areas of technological expertise, develops prototype systems applicable to specific projects.
- (4) Assumes responsibility as the Navy's principal R&D activity in areas of unique professional competence upon designation from appropriate Navy or DoD authority.
- (5) Performs scientific research and development for other Navy activities and, where specifically qualified, for other agencies of the Department of Defense and, in defense-related efforts, for other Government agencies.
- (6) Serves as the lead Navy activity for space technology and space systems development and support.
- (7) Serves as the lead Navy activity for mapping, charting, and geodesy (MC&G) research and development for the National Imagery and Mapping Agency.

LEADERSHIP AREAS: NRL, the Navy's single, integrated corporate laboratory, provides the Navy with a broad foundation of in-house expertise from scientific through advanced development activity. Specific leadership responsibilities and expertise are maintained in the following areas:

- (1) Primary in-house research for the physical, engineering, space, and environmental sciences.
- (2) Broadly based exploratory and advanced development program in response to identified and anticipated Navy needs.
- (3) Broad multidisciplinary support to the Naval Warfare Centers.
- (4) Space and space systems technology, development, and support.

CURRENT IMPORTANT PROGRAMS

Radar Modernization Program (RMP) to provide enhanced capabilities for Naval AEW platforms; All Optical Distributed Sensor System (AODS); High Resolution EO/IR Reconnaissance Camera; Environmental Remote Sensing Programs - Hyperspectral Remote Sensing Technology (HRST) demonstration and a passive microwave ocean WIND SATellite (WINDSAT); Relocatable, meso/tactical-scale dynamical ocean and atmospheric prediction systems; Upper atmospheric/space weather sensors, data analysis, and modeling; Interim Control Module (ICM) to provide interim attitude control and reboot functions for the International Space Station; Army Airborne Command and Contract System (A2C2S) - The critical airborne communications link for the Army's digitized warfighting capability; Hyperspectral Remote Sensing Technology (HRST) Program - To demonstrate hyperspectral imagery for characterization of the littoral battlespace environment and littoral model development.

Cooperative Research and Development Agreements**Title: Diamond CVD Plasma Reactor Development Program**

CRADA Between NRL and 3M, St. Paul, MN

The objective of this CRADA is to develop technology to create low cost, large area, chemical vapor deposited (CVD) diamond coatings or films.

Title: Microtubule Based Controlled Release Coatings

CRADA Between NRL and Biocompatibles Ltd., Middlesex UB8 3PQ, England

The objective of this CRADA is to conduct research into lipid-derived microtubule-based controlled release systems for the control of biofouling and to evaluate innovative concepts.

Title: Case-Based Reasoning Research

CRADA Between NRL and Cognitive Systems, Inc., Stamford, CT

The objective of this CRADA is to extend and develop the ReMind CBR software tool to include concepts developed at NRL that will improve representation and performance in order to effect a reliable and valid problem solution. New user interface requirements will be generated to improve ease of use.

Title: New Paint Formulations for Fluorinated Polyurethane Resins

CRADA Between NRL and 21st Century Coatings, Inc.

The objective of this CRADA is to produce and test new paint formulations of the NRL fluorinated polyurethane resins manufactured under license by 21st Century Coatings, Inc. The current fuel tank coating systems utilizing the NRL resins do not meet the EPA VOC and heavy metal standards for several states. NRL and 21st Century Coatings will work together to develop new formulations and systems that meet or exceed the current standards announced for future implementation.

Title: Electronic Support Systems

CRADA between NRL and AIL Systems, Inc., Deer Park, NY

The objective of this CRADA is to conduct experiments on receiver systems for the purpose of demonstrating the performance of an integrated system design and to determine the performance and commercialization value of such a receiver system.

Title: Molecular Dynamic Study of Acoustic Damping

CRADA Between NRL and IBM Almaden Research Center, San Jose, CA

The objective of this CRADA is to use parallel-computer molecular dynamics codes using atomistic descriptions of matter to study mesoscopic systems.

CURRENT IMPORTANT PROGRAMS (continued)**Title: Laser-Heated Thermoluminescent Glass**

CRADA between NRL and Keithley Instruments, Inc., Cleveland, OH

The objective of this CRADA is to conduct research towards improving the performance of the laser-heated thermoluminescent glass by modifying the composition of the material by changing concentrations of ions and semiconductor nanocrystalites. It is anticipated that this will lead to a significant cost reduction for the laser-heated thermoluminescence reader.

Title: Laser Oligonucleotide Array Fabrication for Genetic Analysis

CRADA Between NRL and Molecular Tool, Inc., Baltimore, MD

The objective of this CRADA is to develop NRL's DNA immobilization chemistry and surface patterning technologies to create a viable testbed comprised of medium-density DNA arrays for multiplexed genetic analyses using MTI proprietary biochemical genetic analysis technologies. To accomplish this, there is a need to (1) develop a stable, covalent method for attaching DNA probes to a solid phase in a biochemically active state; (2) improve attachment strategy so up to forty (40) compositionally distinct DNA oligomers can be attached to a 7mm area; (3) that manufacturing protocols can be applied to yield oligonucleotide arrays useful in conjunction with MTI's genetic analysis biochemical and analytical methods.

Title: Liquid Crystal Alignment Layer Program

CRADA between NRL and Shipley Company, L.L.C., Marlborough, MA

The objective of this CRADA is to provide an optical alignment layer capable of uniform alignment of nematic liquid crystals with a contrast ratio greater than 10. The CRADA will demonstrate a pre-tilt angle in the range of 2° to 5° (suitable for both passive and active matrix TN displays) on one set of substrate surfaces and for one liquid crystal sample material. The CRADA will also demonstrate the robustness of the alignment layer by showing switching for a period of 3 months or more of a prototype TN cell fabricated using the various surfaces.

Title: Virtual Environments for Simulation Based Design

CRADA Between NRL and Lockheed Martin Corporation (LMC) acting by and through Lockheed Martin Missiles and Space Advanced Technology Center, Palo Alto, CA

Title: Downwell Optical Fiber Acoustic and Pressure Monitoring Systems for Oil, Gas and Geothermal Reservoir and Well Management

CRADA Between NRL and CIDRA Corporation, Wallingford, CT

The objective of this CRADA is to determine the feasibility of downwell acoustic (seismic) and pressure measurement with a serially-multiplexed array of fiber optic Bragg gratings used directly as the means to sense a measurand or indirectly as a means to spatially resolve measurements. The parties will also design, fabricate and test one or more laboratory demonstration units to investigate and determine the system performance then educate, train and instruct CIDRA personnel in the design, fabrication, assembly and testing of passive and active fiber Bragg grating sensor readout systems with ultra-high measurement sensitivity.

Title: Evaluation of Dye Sorption Phenomena on Nano-Sized Spherical Particles

CRADA between NRL and Shipley Company, L.L.C., Marlborough, MA

The objective of this CRADA is to increase the level of understanding of the nature of the dye-coated Ludox particles as colorants for particle/polymer composite color filter fabrication.

Title: Research on DNA Sequencing Using an Atomic Force Microscope

CRADA between NRL and Stratagene, La Jolla, CA

The objective of this CRADA is to carry out cooperative research and development relating to the measurement of forces resulting from breaking individual DNA base-pairs in a peeling configuration and to use such forces to directly sequence nucleic acids.

CURRENT IMPORTANT PROGRAMS (continued)**Title: Radiation Hardness in Thin Simox**

CRADA Between NRL and Ibis Technology Corporation, Danvers, MA

The objective of this CRADA is to determine optimal processes parameters to maximize radiation hardness of thin box simox.

Title: Naval Surface Ship Electronic Warfare Research

CRADA between NRL and Digital System Resources, Inc., Fairfax, VA

The objective of this CRADA is to conduct Electronic Warfare research for Naval Surface Ship applications and evaluate innovative concepts for adaptation in Commercial Off The Shelf (COTS) digital equipment and operating systems in support of the AIEWS and similar advanced electronic warfare system concepts.

Title: Proof-of-Principle Experiment of the Vacuum Beat Wave Accelerator

CRADA between NRL and Omega-P, Inc., New Haven, CT

The objective of this CRADA is to conduct research on the Vacuum Beat Wave Accelerator (VBWA). VBWA is an efficient scheme of charged particle acceleration that can produce high energy particle beams in significantly shorter interaction distances. The utilization of processes that can accelerate particles in vacuum eliminates many difficulties encountered when an accelerating medium is used. Development of intense lasers and the study of their interaction with plasmas and electron beams are advanced technologies with many potential Navy and/or DoD applications. In addition to advancing the forefront of scientific research in the interaction of lasers with matter, this work could also lead to new technologies in areas such as material processing, manufacturing, and characterization. The VBWA proof-of-principle experiment integrates with other on-going programs at NRL that utilize intense lasers and the RF electron gun facility.

Title: Fiber Bragg Grating Sensors Development

CRADA between NRL and Astro Technology, Inc., Houston, TX

The objective of this CRADA is to examine the use of fiber Bragg grating sensors in various applications where the use of electrically passive sensors is extremely important. These include strain monitoring in liquefied gas fuel composite tanks and strain monitoring of rocket motor casings and nozzles in long term storage, and static motor testing. The CRADA will result in field testing of instrumentation in these application areas, which will enhance the understanding and knowledge of distributed strain sensor systems for other closely related Navy and DoD applications.

Title: Private Communications Using Chaotic Dynamical Systems

CRADA Between NRL and Dynetics, Inc., Huntsville, AL

The objective of this CRADA is to develop a prototype device and/or a market product that uses chaotic dynamics in electronics circuits to achieve a functional private or secure communications system. Research and development will focus on more secure approaches to encoding or masking information with chaotic waveforms than the simple approaches that have been tried thus far in the field.

Title: Development of Microsensor Coatings

CRADA between NRL and Microsensor Systems, Inc., Bowling Green, KY

The objective of this CRADA is to explore Pulsed Laser Deposition as technology for developing new and more effective coatings for solid-state chemical microsensors.

CURRENT IMPORTANT PROGRAMS (continued)

Title: Patterned Bimolecular Surfaces for High Throughput Biological and Chemical Diagnostics
CRADA Between NRL and Biological Detection, Inc., Pittsburgh, PA

The objective of this CRADA is to determine the efficacy of NRL's technology for fabricating two and three-dimensionally patterned bimolecular surfaces for use with BioDx's fluorescence-based micro-imaging technology, and to evaluate the different patterning techniques with regard to potential commercial viability. It is envisioned that the results of this effort will lead to the development and production of prototype diagnostic devices in a subsequent NRL-BioDx collaborative program.

Title: Fiber Optic Sensor Techniques for Blood Glucose Measuring Instruments

CRADA between NRL and Sunshine Medical Instruments, Inc., Foster City, CA

The objective of this CRADA is to investigate modulation methods and devices for use with polarized light to improve the performance of Sunshine's prototype blood glucose measuring instruments.

Title: Investigation of Spin Wing/Stop Rotor Concept

CRADA Between NRL and Advanced Aerospace Technologies, Inc., St. Louis, MO

The objective of this CRADA is to computationally evaluate the concept of a Spin Wing/Stop Rotor vehicle capable of a smooth transition between the helicopter and airplane (forward flight) modes. The results of the analysis will be used to provide technical support towards the development of the Spin Wing/Stop Rotor concept into an improved vehicle capable of operating efficiently in both hover and forward flight modes.

Title: NQW Devices for Optical Non-Destructive Evaluation of Materials

CRADA Between NRL and Rice System, Inc., Irvine, CA

The objective of this CRADA is to evaluate the utility of NRL developed multiple quantum well devices for use in optical non-destructive evaluation of structural and mechanical materials and their potential commercial viability.

Title: Ion Implantation Technology for GaN and Related Alloys

CRADA Between NRL and Implant Sciences Corporation, Wakefield, MA

The objective of this CRADA is to develop and implement for device and IC fabrication an implantation technology for GaN and its related alloys.

Title: Digital Library Research

CRADA Between NRL and Visual History Foundation, Universal City, CA

The objective of this CRADA is to conduct basic Digital Library Research and evaluate innovative concepts.

Title: Liquid Crystal Material Research

CRADA Between NRL and Spatialight, Inc., Novato, CA

The objective of this CRADA is to couple NRL's electroclinic liquid crystal materials with the monocrystalline silicon active matrix substrates developed by Spatialight, Inc., and thereby develop and test high performance spatial light modulators for both military and commercial applications.

Title: High Power Fiber Amplifiers

CRADA Between NRL and Clark-MXR, Inc., Dexter, MI

The objective of this CRADA is to test the suitability of a broad stripe diode pumped fiber amplifier to replace the Master Oscillator Power Amplifier (MOPA) pumped amplifier currently used in the Clark-MXR Erf stretched pulsed modelocked fiber laser. In the course of this work the characteristics of the amplifier will be modified to attain suitability. A further objective is to maintain a low-cost robust design of the laser amplifier. It is expected that with minor (if any) modifications the fiber amplifier developed at NRL will provide a substitute for the MOPA pumped amplifier at a substantially reduced cost.

CURRENT IMPORTANT PROGRAMS (continued)**Title: Extending the Capabilities of an Optically-gated Scatter Reflectometer**

CRADA Between NRL and Virginia Polytechnic Institute and State University: Fiber and Electro-Optics Research Center (VPI-FEORCE), Blacksburg, VA.

The objective of this CRADA is to explore the possibility of extending the operation of the NRL developed optically-gated scatter reflectometer (OGSR) to new wavelengths and enhancing other capabilities. OGSR is an extremely useful technique for probing the subsurface region of translucent materials such as ceramics, composites, plastics, and diamond translucent materials such as ceramics, composites, plastics, and diamond films. Using scanning techniques, OGSR can be used to directly image two-dimensional planes at or below the surface of such materials. NRL has developed optically-gated reflectometry device operating at 1.3 microns that can scan millimeter-sized subsurface regions of materials in approximately 2 seconds with a spatial resolution of less than 10 microns. The development of an OGSR that operates in the mid-IR or deep red wavelengths would allow for the detection of signals at much greater depths in certain materials.

Title: Diamond Based Materials Research

CRADA Between NRL and Diamond Microelectronics Corporation, Boston, MA

The objective of this CRADA is to develop cost-effective diamond-based, high power/high frequency switches and assorted vacuum electronics.

Title: Germanium Strip Detectors for X-ray and Gamma-ray Spectrometry and Imaging

CRADA between NRL and Physical Sciences Inc., Andover, MA

The objective of this CRADA is to develop a commercial supplier of double-sided Germanium Strip Detectors and associated low-power read out electronics to make a functional system. These detectors provide high energy resolution and imaging of gamma-rays in the 10-1000 keV energy range. Commercial applications range from medical imaging, radioactive waste surveys, non-destructive testing to nuclear monitoring.

Title: Bragg Grating Technology for Use in Marine Seismology via Towed Arrays, Permanent Seabed Installations

CRADA Between NRL and CIDRA Corporation

The objective of this CRADA is to establish the feasibility of using optical fiber and Bragg grating sensors for marine seismic profiling. Bottom-mounted seismic arrays using fiber Bragg grating seismic sensors will be small, lightweight, and require significantly less electric power than conventional piezoelectric sensors. Because the cabling and sensors are fiber optic, the arrays will have larger bandwidths and a higher dynamic range.

Title: Improved Methods for Generating Target Motion for Closed Loop Simulation Facilities

CRADA Between NRL and CARCO Electronics, Menlo Park, CA

The objective of this CRADA is to conduct joint research to gain a better understanding of CARCO's technology through participation in the testing and validation of the Dual Target Motion System at NASA's Ames Research Center. CARCO will conduct an extensive series of experiments/trials in Hanger 2 at the Ames Research Center to support the quantification, development, and verification of the Dual Target Motion System's performance. Data collected from these trials will be forwarded to NRL for analysis as to the credibility of the system for use in the conduct of advanced countermeasures research. NRL will review the data with special emphasis placed on the fidelity of target motion with respect to positioning accuracy and accelerations achieved. The results of this research activity will yield a fundamental understanding of the performance boundaries for such systems and the range of research topics to which low cost electromechanical systems could be applied as compared to higher cost of electronic systems.

CURRENT IMPORTANT PROGRAMS (continued)**Title: Wide Bandgap Semiconductor Research**

CRADA Between NRL and CREE Research, Inc., Durham, NC

The objective of this CRADA is to conduct basic research on the properties of wide bandgap semiconductor and their possible impact on civilian and military applications. The role of intrinsic defects and impurities in materials and device performance will be studied by spectroscopic techniques and correlations with materials processing parameters will be investigated.

Title: Product Evaluation of LDR Switches

CRADA Between NRL and AT&T Corp., Washington, DC

The objective of this CRADA is to demonstrate and provide enhanced functionality into future Navy telecommunication products.

Title: Radiation Testing and Modeling of InP Solar Cells

CRADA Between NRL and Essential Research, Inc., Cleveland, OH

The objective of this CRADA is to determine the radiation response of particular high quality p/n InP solar cells and to initiate the data base needed to implement the displacement damage dose model for this cell technology in order to establish the characteristic radiation curve for this type of solar cell.

Title: Thin Films of Phosphors Based on the Alkaline-Earth Chalcogenides for Storage Applications

CRADA Between NRL and ETOM Technologies Corporation of Rockville, MD

The objective of this CRADA is to demonstrate that thin film phosphors based on the alkaline-earth chalcogenides can be deposited by pulsed laser deposition (PLD) under high vacuum conditions ($<10^{-6}$ Torr) and that the PLD phosphor thin films exhibit bulk-like optical storage properties.

Title: Development of Bi-Stable, High Resolution Reflective Display as a Memory Device

CRADA Between NRL and Opticom ASA

The objective of this CRADA is to develop and build a bi-stable, high resolution reflective display using conducting polymer based plastic substrates and further, to explore technical issues involved with a high definition electrical read and write memory device using a bi-stable cholesteric display and conducting polymer substrates.

Title: Multi-Quantum Well Solar Cells

CRADA Between NRL and International Stellar Technology, Inc., Houston, TX

The objective of this CRADA is to measure and analyze the radiation-induced degradation of multi-quantum solar cells. It is expected that these cells will show radiation characteristics similar to standard solar cells except that the output efficiency of the multi-quantum well cells is expected to be improved because of the effect of the quantum wells.

Title: Marine Geophysical Systems

CRADA between NRL and C&C Technologies, Inc., Lafayette, LA

The objective of this CRADA is to optimize geoscience software and instrumentation for naval mine countermeasure missions and for commercial applications related to the petroleum and telecommunications industries. Software and instrumentation will be made user-friendly to facilitate commercialization.

CURRENT IMPORTANT PROGRAMS (continued)**Title: LOCUTUS Software Support**

CRADA between NRL and Fred Griswold Engineering, Inc., Fredonia, AZ

The objective of this CRADA is to develop a bug-free, accurate, user-friendly program with non-critical hardware demands. Each party will provide expert consultation and technical data to the other with the intent to integrate the Local User Terminal Upgrade System (LOCUTUS) with a number of Local User Terminals (LUTs) that are tuned into the frequency of antennae or receiving dishes of Low Earth Orbit (LEO) satellites. If the cooperative R&D is successful, NRL-SSC will transition a Graphic User Interface (GUI) to the Naval fleet to enhance tactical operations through the manipulation of oceanographic and meteorological data on a real-time basis in a combat or exercise environment. FG intends to market LOCUTUS-based LUTs to university and Government scientists who acquire environmental data for LEO satellites, and to the commercial fishing industry.

Title: Deep-Towed Acoustic/Geophysical System

CRADA between NRL and Seafloor International, Inc., Seattle, WA

The objective of this CRADA is to improve the State of the Art of DTAGS and the SSI developed Integrated Short Base Line (ISBL) navigation systems through research. Joint research between the parties will determine whether coupling the DTAGS with the ISBL would improve the geographical accuracy of NRL's seismic seafloor data interpretation. The joint research would also evaluate whether the ISBL is suitable for deep ocean applications. A second objective of the research is to publish peer-reviewed articles related to basic research and exploratory development achieved cooperatively by the parties. The goal of the research is to improve the knowledge of seafloor environmental features for Naval operations.

Title: Biocides for Ocean and Littoral Applications

CRADA Between NRL and Magellan Companies, Inc. (MCI)

The objective of this CRADA is to test and evaluate MCI biocides and application techniques for ocean and littoral use. As a partner in this CRADA, NRL will evaluate the effects of MCI antifouling materials and application techniques on optical sensor windows, in both laboratory and natural conditions. Through this effort, promising materials that resist biofouling will be identified, and guidance developed on how to improve the materials and application techniques for use in ocean and littoral environments.

EQUIPMENT/FACILITIES

- **EO/IR Low Observables Facility:** The NRL NP-3D is an airborne testbed for multiple applications. Equipped with the AN/APS-145 AEW radar and the latest version of the Cooperative Engagement Capability, this platform supports both the Radar Modernization Program (RMP) and technology demonstrations for cruise missile defense (CMD). It provides the airborne node to demonstrate data sharing in real time between shipboard and airborne sensors for improved fleet defense against cruise missiles.
- **High Performance Computation and Communications Facility:** SGI Origin2000 with 128 processors, 32 Gbytes memory, 52 Gflops peak; HP/Convex Exemplar SPP-2000 with 64 processors, 16 Gbytes memory, 46 Gflops peak; Sun HPC Ultra system with 40 processors, 4 Gbytes memory, 5 Gflops peak; Two TMC CM-500e systems. One with 256 nodes, 32 Gbytes memory, 40 Gflops peak; the second with 32 nodes, 4 Gbytes memory, 5 Gflops peak; EMASS AML/E storage system with 128 Gbytes disk and 50 Tbytes tape; Extensive graphics and visualization facilities; Local ATM networking at 155 and 622 Mbps, regional ATDnet network using ATM/SONET at 2.5 Gbps, and development of all-optical networks.
- **Nanoelectronics Processing Facility (NPF) and Penthouse Facility:** The NPF maintains a tool base for micrometer and nanometer device and structure fabrication. There is a strong emphasis on computer-aided design and lithography utilizing an e-beam lithography system with a 10-nanometer spot size. Other processing includes reactive ion etching, deep ultra violet photolithography, ultra clean oxidation and annealing, and polysilicon and silicon oxide deposition. The micro-assembly lab provides a full sawing, bonding and chip mounting capability. A hands-on capability for compound semiconductor processing is provided in the Penthouse Facility.
- **EPI center:** This facility is dedicated to molecular beam epitaxial (MBE) film growth and in-situ characterization of Group II-VI and Group III-V semiconductors. Through the use of a high vacuum sample transfer system, samples can be moved between the two growth chambers as well as two analysis chambers without exposing the semiconductor structures to atmospheric contamination. In one analysis chamber, an angle-resolved electron spectrometer is used to determine the structure and chemical identity of the epitaxial layers near the film surface. In the second chamber, a scanning tunneling/atomic force microscope is employed to determine surface morphology and near surface electronic properties of the epitaxial layers.
- **Mass Spectrometry Facility:** Principal research instruments include a Finnigan TSQ-70 triple quadrupole mass spectrometer equipped with particle bombardment, electrospray, atmospheric pressure chemical ionization, thermal desorption, electron ionization and chemical ionization and tandem mass spectrometry capabilities.
- **Structural Acoustic Pools:** A steel, cylindrical tank (55 feet in diameter, 50 feet deep, containing 800,000 gallons of de-ionized water), which is vibration and temperature isolated, and instrumented with in-water robotic scanners to generate nearfield acoustic holographic and 3-dimensional laser vibrometric radiation and scattering databases for studying structural acoustics phenomena of scale-model submarines and mines. A second, somewhat smaller "sister" pool, that is similarly instrumented has a sandy bottom for studying buried/near bottom targets.
- **Hyperspectral Towed Array:** The only towed, optical, hyperspectral oceanographic array in the world, which is Ethernet-based with a 40-meter aperture and can be lowered to depths in excess of 100 meters. The array allows the simultaneous measurement of temperature, conductivity, high spectral absorption and attenuation (100 channels), and high spectral downwelling/upwelling irradiance (512 channels), as well as tilt, roll, and depth.

EQUIPMENT/FACILITIES (continued)

- **300KV Transmission Electron Microscope (TEM) Laboratory:** Each TEM magnifies up to 1.5 million times, yielding resolutions of 1.7 angstroms. The TEM Lab includes: an Environmental Cell for real-time observation of reactions in gaseous or liquid environments; a Scanning Image Observation device; and Electron Dispersive Spectroscopy; and Electron Energy Loss Spectrometer, and, multiple imaging devices including a sheet film camera.

Naval Research Laboratory
Washington, D.C. 20375-5320
(202) 767-2541

Commanding Officer: CAPT Bruce W. Buckley
Dir of Research: Dr. Timothy P. Coffey

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	76.695	NA	18.616	95.311
6.2	80.205	NA	70.802	151.007
6.3	75.056	NA	95.797	170.853
Subtotal (S&T)	231.956	NA	185.215	417.171
6.4	20.029	NA	31.389	51.418
6.5	21.333	NA	30.135	51.468
6.6	2.604	NA	5.984	8.588
6.7	11.083	NA	19.979	31.062
Non-DOD	31.440	NA	67.789	99.229
TOTAL RDT&E	318.445	NA	340.491	658.936
Procurement	26.564	NA	60.348	86.912
Operations & Maintenance	12.265	NA	15.950	28.215
Other	8.461	NA	11.356	19.817
TOTAL FUNDING	366.621	NA	429.339	795.960

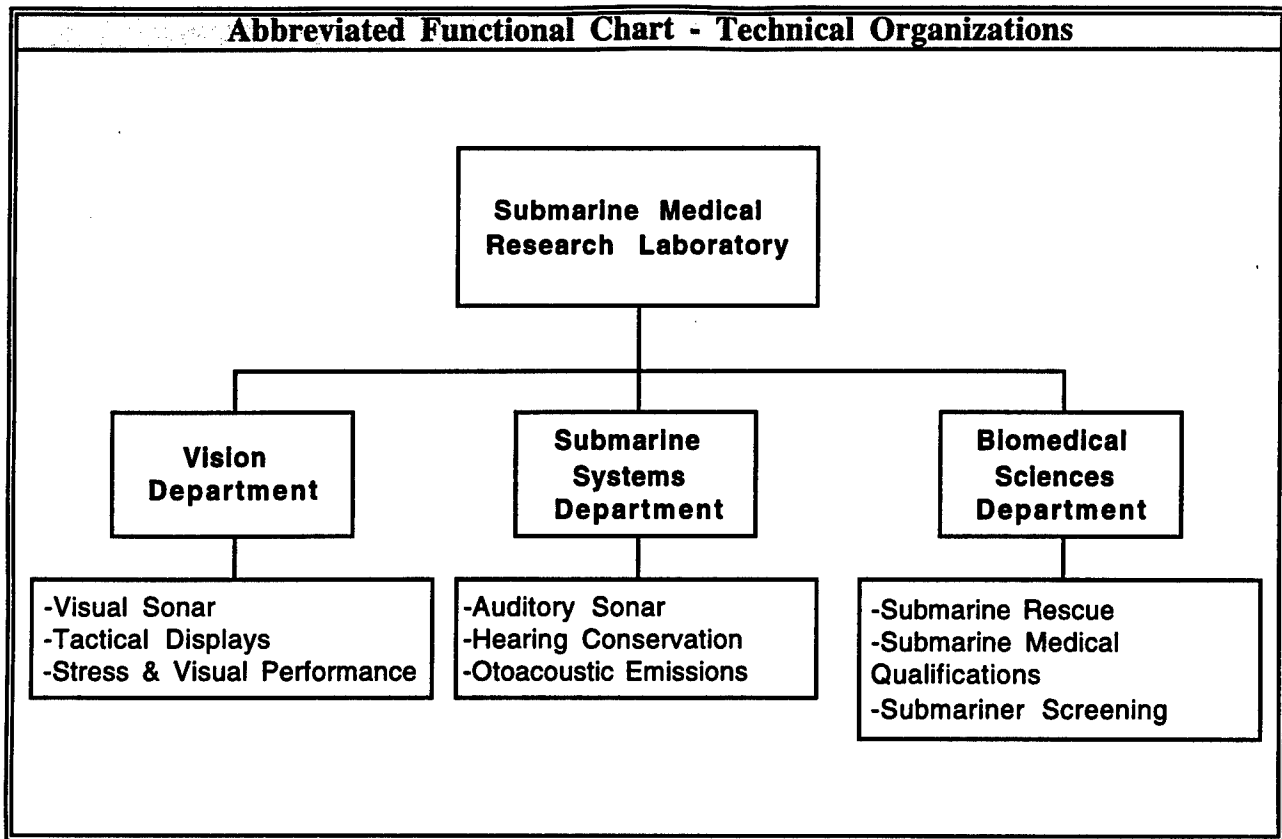
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.285

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	183	183
CIVILIAN	854	921	1,378	3,153
TOTAL	854	921	1,561	3,336

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	3,188.283	REAL PROPERTY	195.334
ADMIN	227.533	* NEW CAPITAL EQUIPMENT	0.321
OTHER	399.043	EQUIPMENT	462.602
TOTAL	3,814.859	* NEW SCIENTIFIC & ENG. EQUIP.	24.198
ACRES	532	* Subset of previous category.	

NA = Not Applicable

Naval Submarine Medical Research Laboratory



Naval Submarine Medical Research Laboratory
Groton, CT 06349-5900
(860) 449-3263

CO: CAPT Mark T. Wooster, MSC
XO: CDR Corley E. Puckett, MSC

MISSION

Provide timely, high quality R&D to the submarine force to enhance auditory and visual sonar operator performance, submariner health and physical standards, closed environment atmospheric monitoring, submarine escape and rescue, and hearing conservation both in air and under the sea.

CURRENT IMPORTANT PROGRAMS

Specific research efforts include:

Submarine escape and rescue.

Enhancement of auditory and visual sonar displays.

Hearing conservation in divers.

Evoked otoacoustic emissions.

Medical qualifications affecting submariners.

Evaluation of submarine atmospheres.

Color vision screening techniques.

Tactical display recommendations.

Effects of sonar transmissions on divers.

Evaluation of visual navigation aids.

Mortality of nuclear submariners.

Psychiatric screening of submariner candidates.

Noise reducing stethoscope.

EQUIPMENT/FACILITIES

Fully equipped auditory, visual, and physiological laboratories, two man-rated hyperbaric chambers, large anechoic chamber, medical research library, and graphic arts capabilities.

Naval Submarine Medical Research Laboratory
Groton, CT 06349-5900
(860) 449-3263

CO: CAPT Mark T. Wooster, MSC
XO: CDR Corley E. Puckett, MSC

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	1.098	NA	0.000	1.098
6.2	0.150	NA	0.000	0.150
6.3	1.858	NA	0.000	1.858
Subtotal (S&T)	3.106	NA	0.000	3.106
6.4	0.363	NA	0.000	0.363
6.5	0.000	NA	0.000	0.000
6.6	0.000	NA	0.000	0.000
6.7	0.000	NA	0.000	0.000
Non-DOD	0.187	NA	0.000	0.187
TOTAL RDT&E	3.656	NA	0.000	3.656
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.119	NA	0.000	0.119
Other	0.967	NA	0.000	0.967
TOTAL FUNDING	4.742	NA	0.000	4.742

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

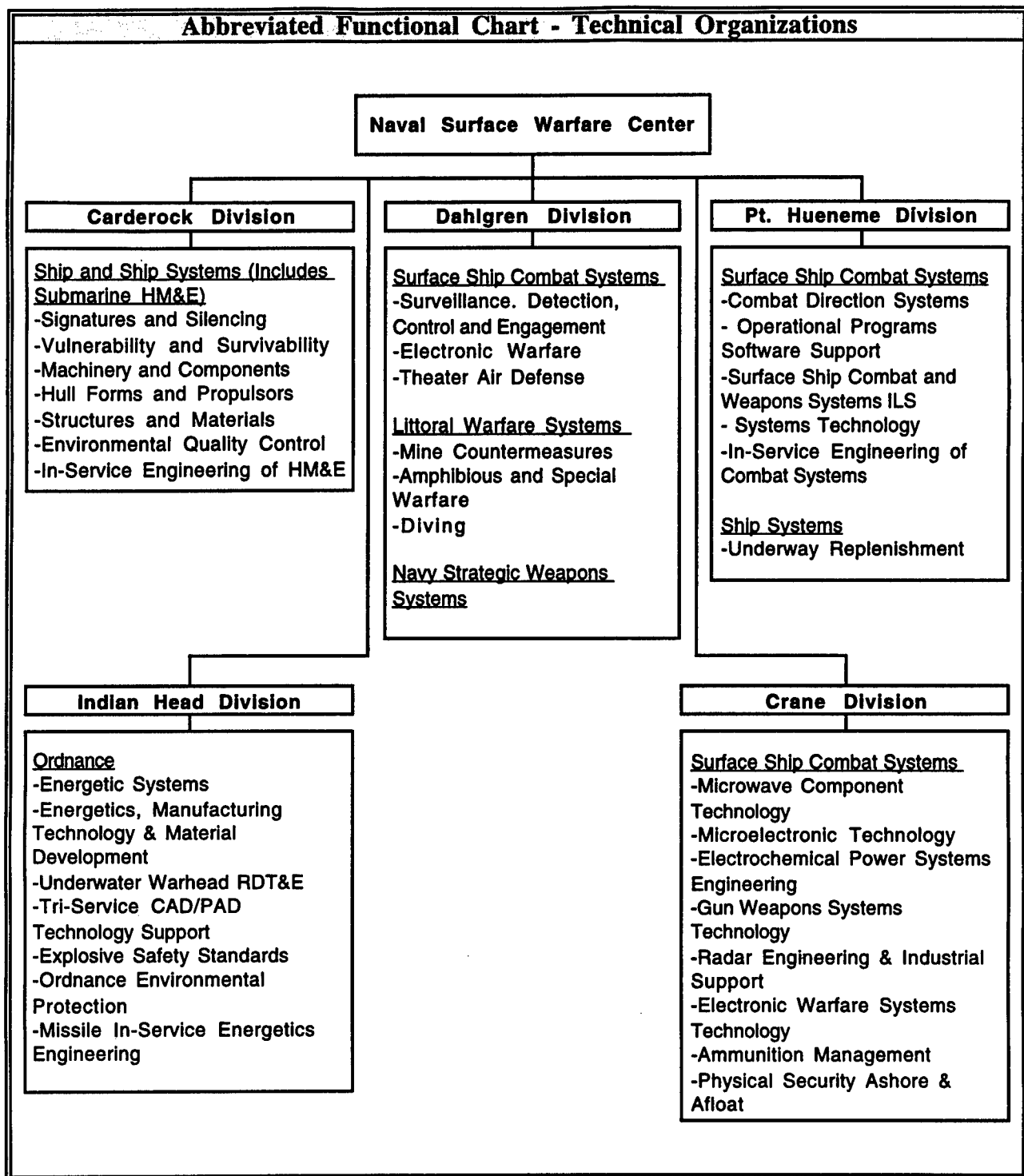
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	8	0	16	24
CIVILIAN	7	9	12	28
TOTAL	15	9	28	52

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	46.190	REAL PROPERTY	8.223
ADMIN	15.798	* NEW CAPITAL EQUIPMENT	0.000
OTHER	0.000	EQUIPMENT	4.020
TOTAL	61.988	* NEW SCIENTIFIC & ENG. EQUIP.	0.175
ACRES	0	* Subset of previous category.	

NA = Not Applicable

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Naval Surface Warfare Center



Naval Surface Warfare Center
Arlington, VA 22242-5160
(703) 602-0632

Commander: RADM K.K. Paige.
Technical Dir.: Dr. Ira Blatstein

MISSION

Operate the Navy's full spectrum RDT&E, engineering and fleet support center for ship hull, mechanical and electrical systems, surface ship combat systems, coastal warfare systems, and other offensive and defensive systems associated with surface warfare.

CURRENT IMPORTANT PROGRAMS

Propulsion Machinery Systems and Components Research, Development, Test, Evaluation and In-Service Engineering. Hull, Mechanical and Electrical (HM&E) Auxiliary Machinery Systems and Components Research, Development, Test, Evaluation and In-Service Engineering. HM&E Electrical Machinery Systems and Components Research, Development, Test and Evaluation and In-Service Engineering. Hull and Deck Machinery Systems Components Research, Development, Test and Evaluation and In-Service Engineering. Surface Warfare Modeling and Analysis. Ship Vulnerability and Survivability. Surface and Undersea Vehicle Hull, Machinery, Propulsors and Equipment. Platform Systems Integration. Combatant Craft. Surface and Undersea Vehicle Acoustic and Non-Acoustic Silencing. Materials and Processing Technology for HM&E and Combat Systems. Environmental Quality Science and Systems. Platform systems integration AEGIS combat system. Ship self-defense, including the self-defense test ship. Cruise weapon systems-Tomahawk and Harpoon. Gun weapon systems. Standard missile. Continuous processing of composite propellants (an international cooperative R&D agreement to develop processing). Ordnance environmental R&D of energetics processing technologies. Gun propulsion R&D for the Navy's Electrothermal Chemical (ET-C) gun and Range Enhancement Near-Term (RENT) programs. Tri-service RDT&E, engineering, manufacturing, and fleet support for cartridges, cartridge and propellant actuated devices, and aircrew escape propulsion systems. RDT&E for Navy and Marine Corps Mine Countermeasures (MCM) including: distributed explosives technology, demonstrative/advanced countermeasure system, surf zone MCM, and shallow water MCM. Gun weapon system replacement program. MK 15 Phalanx close-in weapon system overhaul project. MK 45 gun engineering project. 76mm MK 75 program and life cycle support. SLQ-32 electronic countermeasures systems. Miniature/microminiature electronic repair. Precise integrated navigation systems (PINS) ISEA/ILS/DOP. AN/SYQ-13 navigation systems. Trident. Submarine Launched Ballistic Missile (SLBM) targeting. Unmanned Aerial Vehicle (UAV). Ship self-defense systems. Vertical Launch System (VLS). Gun ammunition. Mines. Warheads. ASW systems. EW systems. AEGIS radar, search and track. EM effects. Magnetic silencing. Chemical and biological defense. Ship/airborne mine CM combat system integration. Diving and life support. Special warfare. Amphibious warfare. Land Attack Cruise Missile Defense. ShipSelf Defense System (SSDS) MK I. Advanced Integrated Electronic Warfare System (AIEWS). Navy TBMD COEA. Infrastructure Assurance. Navy Operations Other Than War Technology. Composite Mast. BW Detector Development. High Performance Distributed Computing (Hi-Per-D). SC-21. UAV. Naval Surface Fire Support. Combat and Weapon System Safety. Modeling and Simulation. Organic MCM. Offensive Trainers. Interactive Telemaintenance. Naval Shore Fire Support T&E. Twire Auto Systems (TWARSES). Evolved Sea Sparrow Missile Test and Evaluation. Surveillance Radar.

Cooperative Research and Development Agreements

Dahlgren Division

1. Development of New Software Products Based on NSWCDD Supersonic Airflow Programs.
The objective of this task is to develop new software products embodying (a) previously developed original work of NSWCDD on supersonic airflow programs embodied in the software package

CURRENT IMPORTANT PROGRAMS (continued)

identified as 'ZEUS' and (b) the derivative work embodying trade secret data received from NEAR making the software products more suitable for commercialization by NEAR.

2. Development of a New and Improved Launcher for the Shoulder-Launched Multi-Purpose Assault Weapon (SMAW). The objectives of this task are: (1) to develop and transition to production the SMAW lightweight launcher, (2) to develop and transition to production a new SMAW spotter round with acceptable ballistics and lower production cost, (3) the successful transfer of the current SMAW technical data package, and (4) to investigate and incorporate other system improvements, as appropriate.

3. Research and Development Contributing to the Understanding of High-Voltage Connector Technology in Low-Inductance Environments. The objective of this task is the research and development contributing to the understanding of high-voltage connector technology in low-inductance environments along with multiple usage scenarios. NSWCD and Raymond Engineering (RE) will evaluate and characterize the performance of the RE-developed removable Exploding Foil Initiator (EFI) and connector.

4. Amphibious, Marine Corps, and Mine Warfare C4I. The objective of this task is to develop a communication architecture and command and control overlay for the real-time command of maneuver units within a littoral scenario. In particular, this agreement focuses on the information exchange requirements of maneuver units in an amphibious assault that includes mine countermeasures operations. This effort will address the suitability of land-based maneuver control system suites including radio and/or cellular communications devices to extend Joint Maritime Command Information System (JMCIS) to the individual unit/sailor or marine. The objective of this agreement is to significantly reduce the cost and shorten the development and deployment cycle of an integrated voice and data communication system that meets the near-term needs of current littoral operations and provides an architecture for joint operations and growth in the future.

5. PCR Destruction of Volatile Organic Compounds. The objective of this CRADA with Physics International is to perform a parametric study of the NSWCD PCR in search of the least power deposited into the corona discharge per unit air flow that still destroys more than 98% of a 500 ppm toluene impurity in an atmospheric pressure air flow. Parameters involved in this investigation include (but are not limited to) voltage risetime, applied voltage pulse width, amplitude and rep-rate, and air flow through the PCR and humidity.

6. Compliant Barium-Compound Substrate Technology for Chemically Deposited PbS and PbSe Monolithic Focal Plane Arrays. The objective of this CRADA with Sensarray Corporation is to develop an enabling technology that would allow the integration of infrared optical detector arrays and silicon electronic circuitry onto a single substrate. The integrated sensors must satisfy the requirements for state of the art infrared detection in terms of spectral response, sensitivity, and temperature of operation. They should also have the capability of on-chip signal processing. The output of the sensors must be directly applicable for electronic decision-making and be commensurate with more complicated electronic processing for target detection and pattern recognition.

7. Technical Assistance to CIT. The objective of this agreement with Virginia Center for Innovative Technology is to transfer technology from NSWCD to those companies in the Commonwealth of Virginia that through the CIT have requested such technology. It is expected that technology is the fields of Devices and Sensors, Information and Systems Sciences, Advanced Data Processing Methods, Pulsed Power Technology, Simulation and Modeling, and Electromagnetic Environmental Effects will be of the most interest for Cooperative Research.

CURRENT IMPORTANT PROGRAMS (continued)

8. Evaluation of Loral on Environmental Remediation (13 Feb 1995 - 30 June 1996). Loral Federal Systems - Akron is conducting an internal R&D program to determine if an airborne laser is a suitable sensor to use for environmental remediation projects, such as, looking for small artillery shells scattered on the sea bed in shallow water. Coastal Systems Station (CSS) will provide information on past experiences with boat-mounted lasers, provide information on test sites, give reviews of test and analysis reports, and list recommendations on the suitability of the airborne laser. This supports the CSS project MUDSS (Mobile Underwater Debris Sensor System).

9. Archaeology Survey Using SINS (13 March 1995 - 13 March 1998). The Florida State University Marine Laboratory is conducting underwater archaeological surveys using traditional subsea mapping techniques. The Coastal Systems Station is providing to FSU manpower and equipment to map these regions with the SEAL In-shore Navigation System. This is providing CSS with the opportunity to test new equipment in controlled conditions and compare with traditional systems. FSU is gaining additional techniques in mapping and the use of new Navy equipment not commercially available.

10. OMNI Directional Vehicle Technology for Helicopter Support. AIR TRAX Inc. is developing new ground support vehicles for use with helicopters. Key to these vehicles is the development of a new ground platform which incorporates the OMNI Direction Vehicle technology which has been developed at the Coastal Systems Station. The Coastal Systems Station is benefiting through the development of new support platform of potential military use.

11. SDV-X Test and Evaluation (30 Sept 1996 - 30 September 1999). Columbia Research Corporation has preliminary design concepts for a Swimmer Delivery Vehicle which they wish to market to a foreign government. CC desires to use the expertise and facilities of the Coastal Systems Station to test and evaluate design and prototype vehicles.

12. Composite Manufacturing Process for Special Operation Forces Maritime Craft - CSS and SCI Inc. have entered into this agreement to develop concepts in composite materials manufacturing. This concept will lead to an innovative composite material preform framing system, to produce integrated frame structures during a single cure cycle. This technology will result in light weight, rugged, reproducible, components that can physically and mechanically withstand the water environment better than previously available composite systems.

13. Navy Experimental Diving Unit and Diving Systems International - Development of hybrid Dive/Gas Mask - The NEDU and DSI entered into this agreement in order to design, construct, and perform engineering analysis of a prototype Hybrid Dive/Gas Mask. DSI intends to manufacture and market this device if it proves successful. In addition to the commercial application of this concept to the private sector, unique applications to the SEAL community have been identified.

14. CSS and Stidd Systems Inc - Submersible Boat Development and Commercialization - This CRADA covers engineering and test services in support of Stidd Systems, Inc.'s production and development of the SEAL submersible Boat. This CRADA will provide Stidd Systems with engineering support in any or all of the following areas: naval architecture, mechanical, hydraulic, and electronic systems; composite materials; thruster design; ballast systems; engineering analysis; and testing of prototype vehicle.

Carderock Division

1. Precision Sea Systems Corp. In an agreement with Precision Sea Systems Corp., NSWCCD will provide assistance in designing an impeller driven system to assist deep sea divers with a propulsion system that will give more thrust and power with a smaller and lighter unit.

CURRENT IMPORTANT PROGRAMS (continued)

2. Use of Spinning Microfilters to Separate Oil from Water for Abatement of Marine Oil Spills. Working with Marine Spill Response Corporation, CDNSWC personnel will demonstrate technology to separate seawater from oil spill fluids in a wide range of viscosities using nonclogging spinning microfilter oil/water separator technology.

3. Technical Assistance to the University of Maryland Technology Extension Service. The objective of this Agreement is to transfer technology from CDNSWC to those companies in the State of Maryland that, through UMCP, have requested technology assistance. It is expected that technology in the fields of chemical processing, testing, manufacturing technology, safety, electronics and environmental technology will be of the most interest for Cooperative Research.

4. Ben Franklin Technology Center (BFTC). The objective of this Agreement is to transfer technology from CDNSWC to those companies in the Philadelphia metropolitan region that through the BFTC have requested such technology. It is expected that technology in the fields of 1) Acoustics, 2) Advanced Materials and Structures, 3) Environmental, 4) Machinery Systems and 5) Ship Technology will be of the most interest for Cooperative Research.

5. NAVATEK II Model Tests. The objective of this agreement with the Pacific Marine and Supply Company, Ltd. is to broaden CDNSWC's database for SWATH technology and validate model prediction techniques. A second objective is to improve the powering performance of NAVATEK II, and its seakeeping characteristics to refine and facilitate the commercialization of this technology by Pacific Marine and Supply Company.

6. Double Hull and Composite Material/Structure Technologies. Ingalls and CDNSWC will perform a cooperative research and development effort to develop composite material/structures and double hull structures and associated subelements and technology for surface ships. It is anticipated that the work conducted will result in designs that can be realized in advanced surface combatants, retrofit activities to same, and commercial applications alike. The goals for these new designs will be tailored for each maintenance, and comparable cost, or lower. Ingalls, upon successful completion of development, intends to carry out a plan for marketing the technologies for a variety of naval and commercial applications.

7. Shipboard Power Systems Improvement Program. The intent of this CRADA with Westinghouse Electric Corp., Instrumentation & Control Systems Dept. (WI&CSD) is to evaluate specific applications of WI&CSD developed power and control system designs and concepts to Navy and commercial ships. Successfully proven applications may later be shared with other Westinghouse Departments to improve commercial product lines.

8. Study of Reduced Fire Hazard Silicone Materials for Navy Applications. The objectives of the CRADA with Dow Corning Corporation are to develop, document and evaluate silicone-based or silicone modified advanced fire resistant materials. Also, reformulate and optimize processing characteristics of the above mentioned polymeric materials to conform to Navy selected fabrication techniques. Facilitate successful fire resistant materials for use in commercial applications. Organize technical workshops involving Navy and Dow Corning personnel to further understand the needs and capabilities of the partners.

9. Modular Utility Core. The objective of this partnership with the Ben Franklin Technology Center is to jointly develop a modular utility core for low/moderate income housing. This core will be a prototype modular unit containing the mechanical, electrical and energy management systems for residential housing. The prototype modular utility core is intended to be fabricated at Naval Surface Warfare Center, Carderock Division - Philadelphia, PA, transported to a residential site and installed into an existing house being rehabilitated.

CURRENT IMPORTANT PROGRAMS (continued)

10. Recycling of Navy Ship Plastic Waste Into Marine Pilings. The objective of the work performed under this Agreement with Seaward International, Inc. is to determine if Navy ship waste plastic can be used as a core in the construction of SEAPILE composite marine pilings without degradation of their performance characteristics.

11. The Intelligent Shock Mitigation & Isolation System Through Applied RSPM Technology. The objective of the CRADA with the ISMIS Consortium is to first perform the remaining development work to refine and upgrade RSPM control algorithms for Naval applications to meet a compelling need for Naval isolation technology; and secondly to scale up and test the fully integrated systems in mock-ups and simulators to verify the technology. The objective of the overall RSPM program is to create a commercially available family of ISMIS products through applied RSPM that will both meet the compelling need for Naval isolation technology and satisfy the uses of ISMS in seismic protection of structures.

12. Light Scattering Measurement Techniques and Practices. The technical objective of the CRADA with the Surface Optics Corporation is to develop standard materials for verifying polarized BRDF measurements in the visible and infrared spectral region. Currently there are no accepted standard materials for verifying Mueller matrix BRDF measurements in general, or for unpolarized scattering measurements in the infrared. Work performed under this CRADA will produce well characterized sample materials that can be theoretically analyzed to predict the polarized BRDF which can be used to verify the experimental measurements.

13. Technical Assistance to the Center for Innovative Technology (CIT). The objective of this Agreement is to transfer technology from CDNSWC to those companies in the Commonwealth of Virginia that, through CIT, have requested technology assistance. It is expected that technology in the fields of acoustics, advanced materials, environmental technology, hydromechanics, machinery and ship technology will be of the most interest for Cooperative Research.

14. Centrifugal Casting Technology. The objectives of the CRADA with U.S. Bronze and Machine, Incorporated are to: 1) Develop techniques for synthesis of remeltable TIC/bronze and/or WC/bronze or both, metal matrix composite ingots; 2) Develop centrifugal casting procedures; 3) Scale up ingot size from laboratory to production size, including centrifugal casting procedures from bench scale to large size castings respectively; 4) Produce wear resistant full size components such as cylinder liners, bearing races, gears, flywheels and others as need arises; and 5) Commercialize the technology and the product for U.S. markets beyond Navy (and DoD) components and applications.

15. Resonance Apparatus. The objective of this Agreement with the Rohm and Haas Company is to obtain resonance apparatus evaluation of twelve samples covering a wide range of frequencies by the use of time-temperature superposition of data obtaining in the kilohertz region as a function of temperature. These results will be analyzed for the insight possible into the molecular mechanisms responsible for the dynamic behavior. Of particular interest is to compare the data obtained with the resonance apparatus to the data obtained from commercial equipment for the same purpose. It is hoped that the potential advantages of using the resonance apparatus will be demonstrated by these measurements.

CURRENT IMPORTANT PROGRAMS (continued)**Crane Division**

1. Southern Indiana Development Commission (21 June 1995 through 21 June 1998). The Southern Indiana Development Commission (SIDC) will provide Technology Access Services through this Agreement to technologically based companies having technical needs that are similar to Crane Division, Naval Surface Warfare Center's (CRDNSWC) skills. This technology access service program at SIDC will provide technology assessments, technology information services, and technology transfer engagements to firms in the region and CRDNSWC personnel. The purpose of this CRADA is to foster the transfer of technology from CRDNSWC to companies, in particular small businesses, who request technologies through SIDC's technology access service. While all the types of technology that are available to be transferred and may be determined by CRDNSWC and SIDC to be of mutual interest are not specifically identified herein, the primary areas are:

- 1) Microelectronic Technology.
- 2) Microwave Technology.
- 3) Acoustic Sensor Technology.
- 4) Failure Analysis/Materials.
- 5) Night Vision/Electro-Optics Technology.
- 6) Non Destructive Test.

2. Cinergy Technology, Inc. (9 August 1996 through 9 August 1999). CTI is entering into a CRADA with NAVSURFWARCENDIV Crane for the development and evaluation of the Proton Exchange Membrane (PEM) Fuel Cell Technology. NAVSURFWARCENDIV Crane intends to provide CTI further insight and recommendations in the development of the PEM fuel cell technology including its operating characteristics and reliability under various test applications. This CRADA will enable CTI to gain necessary information for the development of the PEM technology for commercial and industrial applications. NAVSURFWARCENDIV Crane is a leading U.S. military base in electrochemistry and power systems designs and applications and will add to its knowledge base with a focus of the technology to military applications. These applications include shipboard, submarine and man portable uses. The primary technology assessment vehicle is the Ballard Power Generating System (PGS) 103.

3. Martin Marietta Corp. Automation Systems Company (24 March 1996 through 20 September 1999). This Agreement provides the framework for the reconfiguration of existing Consolidated Automated Support System (CASS) assets into a deployable Integrated Maintenance Management System (IMMS) for use on L Class and DDG Class Navy combatants.

4. American Competitiveness Institute (20 September 1996 through 20 September 1999). The Electronics Manufacturing Productivity Facility (EMPF), operated by the American Competitiveness Institute (ACI), is entering into a CRADA with NAVSURFWARCENDIV Crane for the development, application and transfer of new electronic manufacturing technologies to both military and commercial sectors. Under this cooperative agreement, Crane provides linkages with Navy and DoD programs to evaluate electronic manufacturing technology needs in light of Navy and DoD requirements. Crane is unique in that they represent in excess of 150 major and minor Navy customers within their organization, and have as one of their primary missions that of assisting these programs to field quality, reliable hardware that meets the intended mission parameters. EMPF/ACI's mission of providing the latest manufacturing technologies to the nation's electronics industry will be enhanced by Crane's participation in this agreement.

5. Rose Hulman Institute of Technology (Educational Partnership) (27 March 1996 through 27 March 2001). The purpose of this Agreement is to aid in the educational experience of Rose Hulman students by providing a mechanism by which the students can benefit from the staff expertise, unique facilities and equipment related to undersea.

CURRENT IMPORTANT PROGRAMS (continued)

6. Analytic Sciences Corporation (ASC). This CRADA will develop and initiate the Computer Assisted Technical Transfer (CATT) Program. The CATT Program digitizes technical data package information in a new format using multimedia capability and internet links.

7. Center for Battery Information & Technology, Inc. (CBIT). This CRADA will establish protocols and improve both the performance and life cycle cost of power systems.

8. EG&G. The purpose of this CRADA is to develop an amorphous silicone process for flat panel displays.

The agreements 9 - 12 are for sale of test services to private industry under statute 10-USC 2539b.

9. Bath Iron Works. Support Capacity Testing and matching of individual cells to optimize battery performance.

10. Bath Iron Works. To develop procedures for cell matching, testing and refurbishment of No-Brake Power Supply Battery for DDG-51 Class Ships.

11. Hughes Technical Services Company. Blowing Dust Test for AN/AWM-101 Hellfire Test Set.

12. Center for Battery Information and Technology, Inc. (CBIT). Batteries and Ancillary Equipment Test and Evaluation.

13. Memorandum of Agreement (MOA)/Memorandum of Understanding (MOU) with American Plastics Partners to provide consultation, materials, and failure analysis of plastics.

14. MOA/MOU with Betc to provide testing and evaluation of electrochemical power sources for electric vehicles and hybrid electric vehicles.

15. MOA/MOU with Naval Post Graduate School to exchange data, research, technical expertise, and the use of equipment and facilities.

Indian Head Division:

1. Evaluation of Near Net Shape Casting for the Fabrication of Specialty Aerospace Components. The objective of the CRADA is to evaluate the feasibility, advantages and impact of fabricating metal aerospace components using net shape casting technology. This will be done through analysis of characteristics, building and loading specially designed prototype hardware and subjecting the loaded assemblies to environmental and performance tests.

2. Environmentally Safe Demilitarization Technologies for Conventional Ammunition. The objective of the CRADA is to mutually develop environmentally safe process for removal of energetic material from reusable motor casings.

3. Applied Research into Composite Air Bag Propellants. The objective of the CRADA is to utilize IHDIV manufacturing technology to develop processes originating with OEA, Inc. The ultimate goal would be a controlled release of a gas producing energetic material.

4. Technical Assistance to the University of Maryland's Technology Extension Service. The objective of this CRADA is to transfer technology from IHDIV to those companies in the State of Maryland that, through University of Maryland at College Park, have requested technology assistance. It is expected that technology in the fields of chemical processing, testing, manufacturing technology, safety, electronics and environmental technology will be of the most interest for cooperative research.

CURRENT IMPORTANT PROGRAMS (continued)

5. Application of Radiation Processing Technologies to the Manufacture and Demilitarization of Energetic Materials. The objective is for Damilic Corporation and IHDIV to mutually determine the feasibility of safely curing energetic materials and removing energetic material through radiation processing technology.

6. Applied Research into Instructional and Information Exchange Technologies. The objective of the CRADA is to develop, demonstrate, introduce and transfer new and evolving information technologies relating to training and instructional approaches. The technology will be transferred from the innovator (US Navy) to the user (Charles County Community College, Maryland) and further developed to meet mutual needs.

7. Applied Research into Laser Initiated Explosive Subsystems. The objective of the CRADA is to use a process designed by Ensign-Bickford Company to determine sensitivity and safety aspects with Navy propellant formulations.

8. Advanced Modular Arm-Fire Device for Multiple Applications. The objectives to integrate advanced technology, such as found in EFI detonators, 'smart electronics' and miniaturized sensors, for the purpose of demonstrating and evaluating low cost, advanced explosive initiation technology.

9. Evaluation of Biotechnology to the Treatment of Nitrate Ester Contaminated Wastewater with High Inorganic Nitrates. The objective is to evaluate the effectiveness, efficiency, and compatibility of applying EFX's biotechnology solutions to explosive processing waste streams.

Port Hueneme Division

1. United Defense Limited Partnership to jointly explore the potential application of advanced materials, specifically titanium, for use in marine applications. Performing a study on the cost-benefits of titanium for use in above deck components such as the Vertical Launching System MK 41. A prototype hatch is being manufactured which will undergo testing at the Surface Warfare Engineering Facility (SWEF) and Self-Defense Test Ship (SDTS) in early 1998.

2. Agreement with Ventura County Economic Development Association (VCEDA) to explore technologies for enhancing communication between Port Hueneme and support contractors. Included is the use of the World Wide Web of technology transfer through providing information and easy access to intellectual property within NSWC, and unique facilities.

Personnel Exchange

Dr. Harold Szu of NSWCDD served as a Lamson Professor and the Director of the Center for Advanced Computer Studies at the University of Southwestern Louisiana (Lafayette, LA) during the 95-96 academic year. In addition to being Director of the Center, he taught neural networks and wavelets courses at the graduate level.

EQUIPMENT/FACILITIES

Dahlgren Site: Potomac River Test Range, EM Vulnerability Assessment Facility, Search and Track Sensor Rest Facility, Warhead Res Test Facility, Aegis Computer Center, Explosives Experimental Area, EM Pulse Facility, Phalanx Instrumented Test Facility, Anechoic Test Facility, Chem-Bio Eng Facility, Hypervelocity Wind Tunnel, Nuclear Weapons Radiation Effects Complex, General purpose labs, Compartmented laboratory.

EQUIPMENT/FACILITIES (continued)

Dahlgren Coastal Systems Station Site: Expeditionary Warfare Modeling and Simulation, Mines and Mine equipment and systems, Specialized Mine Warfare, Transducers and Sonar Modeling for MCM, Special Warfare Mission Equipment, Ocean simulation to 2,250' depth, Diving and Life Support Systems Development and Analysis, Fleet Diving Support Complex, Gulf Test Range, Magnetic Detection and Classification Range, Mine Exploitation Complex, Specialized Environmental Testing, Pier Space, Boats, Heliport Complex with Equipment.

Crane Division: Electron Linear Accelerator Facility. Failure/Material Analysis Facility and Equipment. Electrochemical Power Systems Facility with Test and Evaluation Equipment. High-Energy Battery Evaluation Facility. Pyrotechnics Development and Evaluation Facilities. Microwave Components Specialized Power Supplies and Test Stations. Glendora Lake Testing Facility. 100-Meter Underground Firing Range.

Carderock Bethesda Site: Simulation, Planning and Analysis Research Center. Explosives Test Pond. Data and Image Processing Systems. David Taylor Model Basin Complex. Maneuvering and Seakeeping Basin. Rotating Arm Basin. Radio-controlled Model Facility. Circulating Water Channel. 24-inch and 36-inch Cavitation Channels. Dynamic Control System Simulator. 140-foot Towing Basin. Hydrodynamic/Hydroacoustic Technical Center. Deep Submergence Pressure Tanks. Structural Evaluation Lab. Wind Tunnels. Low Observable Materials Lab. Marine Composites Lab. Marine Coatings and Corrosion Control Facility. Shipboard Environmental Protection Facility.

Carderock Philadelphia Site: Full-scale Improved Performance Machinery Program (IPMP) (SSN-21) Steam Propulsion Land Based Test Site. Full-scale LSD-41 Diesel Propulsion Land Based Test Site. Full-scale DDG-51 Gas Turbine Land Based Test Site. Full-scale Electric Drive/Machinery Module Land Based Test Site. Full-scale Gear Meteorology and Calibration Lab. Full-scale Air Compressor Test Site. Full-scale Submarine Life Support Test Site. Full-scale Submarine Generator Test Site. Full-scale Submarine Ship Service Generator Test Site. Fire, Pollution, Marine Equipment Lab. Full-scale Conveyor and Elevator Test Complex. Full-scale Submarine Mast Bending Test Facility. Full-scale Submarine Periscope/Antenna Test Sites. Full-scale Submarine Buoy Communication Test Site. Chemistry and Metallurgy Lab. Full-scale Gravimetric Flow Calibration Lab. Test Operations. Analysis and Control Center. Full-scale Steam Propulsion Testing Complex. Marine Tribology Lab.

Carderock Annapolis Site: Fire Research and Air Contamination Facility. Machinery Systems Silencing Lab. Acoustics Materials Lab. Magnetic Fields Lab. Advanced Electrical Machining. Technology and Development Facility. Submarine Fluid Dynamics Facility. Electric Power Tech Lab. Metallic Materials and Processing Facility. Deep Ocean Pressure Simulation Facility.

Carderock Division - Bayview, ID: Acoustic Research Detachment.

Carderock Division - Memphis, TN: Large Cavitation Channel (LCC).

Carderock Division - Norfolk, VA: Combatant Craft Engineering Detachment.

Carderock Division - Portsmouth, VA: Shock Trials Instrumentation.

Carderock Division - Cape Canaveral, FL: Research Vessel Hayes.

Carderock Division - Fort Lauderdale, FL: South Florida Test Facility.

EQUIPMENT/FACILITIES (continued)

Carderock Division - Panama City, FL: Lauren & Athena Research Vessels/Ship Systems.

Carderock Division - Bremerton, WA: Carr Inlet Test Facility.

Carderock Division - Ketchikan, AK: Southeast Alaska Facility.

Indian Head: Continuous processing facility. Composite case/component overbraiding facility. Synthesis and scale-up facilities for all types of energetic materials. Test facilities. Surface Warfare Engineering Facility. Electrostatic Discharge (ESD) facility.

Port Hueneme Division, Port Hueneme, CA: Surface Warfare Engineering Facility. Self-Defense Test Ship (SDTS).

Port Hueneme Division, Dam Neck, VA: Software program generation and life-cycle maintenance laboratories.

Indian Head Site: Composite propellant and plastic bonded explosives facility. Energetic chemicals pilot plant. Energetic chemicals synthesis laboratory. Energetic materials formulation and characterization laboratories. Energetics environmental evaluation facility. Energetics non-destructive test analysis facility. Energetics performance evaluation facility. Explosive test chambers (bombproofs). Explosives and propellant aging facilities. Joint services cartridge and propellant actuated device performance evaluation facility. Multibase propellant processing facility. Nitramine gun and high energy propellant facility. Ordnance device development and prototyping. Pyrotechnic materials facility. Rocket motor and warhead process development facility. Rocket motor case braiding facility. Solid energetic material continuous processing facility. Solventless double base propellant facility. Surface warfare engineering analysis and design facility. Tomahawk functional ground test facility. Weapon simulator/emulator device development and prototype facility.

Naval Surface Warfare Center
Arlington, VA 22242-5160
(703) 602-0632

Commander: RADM K.K. Paige.
Technical Dir.: Dr. Ira Blatstein

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	4.868	NA	NA	4.868
6.1 Other	6.527	NA	3.167	9.694
6.2	70.908	NA	79.321	150.229
6.3	49.701	NA	51.293	100.994
Subtotal (S&T)	132.004	NA	133.781	265.785
6.4	233.090	NA	163.498	396.588
6.5	95.690	NA	64.208	159.898
6.6	8.292	NA	22.267	30.559
6.7	51.326	NA	50.758	102.084
Non-DOD	0.000	NA	0.000	0.000
TOTAL RDT&E	520.402	NA	434.512	954.914
Procurement	397.100	NA	429.900	827.000
Operations & Maintenance	364.700	NA	246.700	611.400
Other	326.600	NA	165.700	492.300
TOTAL FUNDING	1,643.102	NA	1,321.712	2,964.814

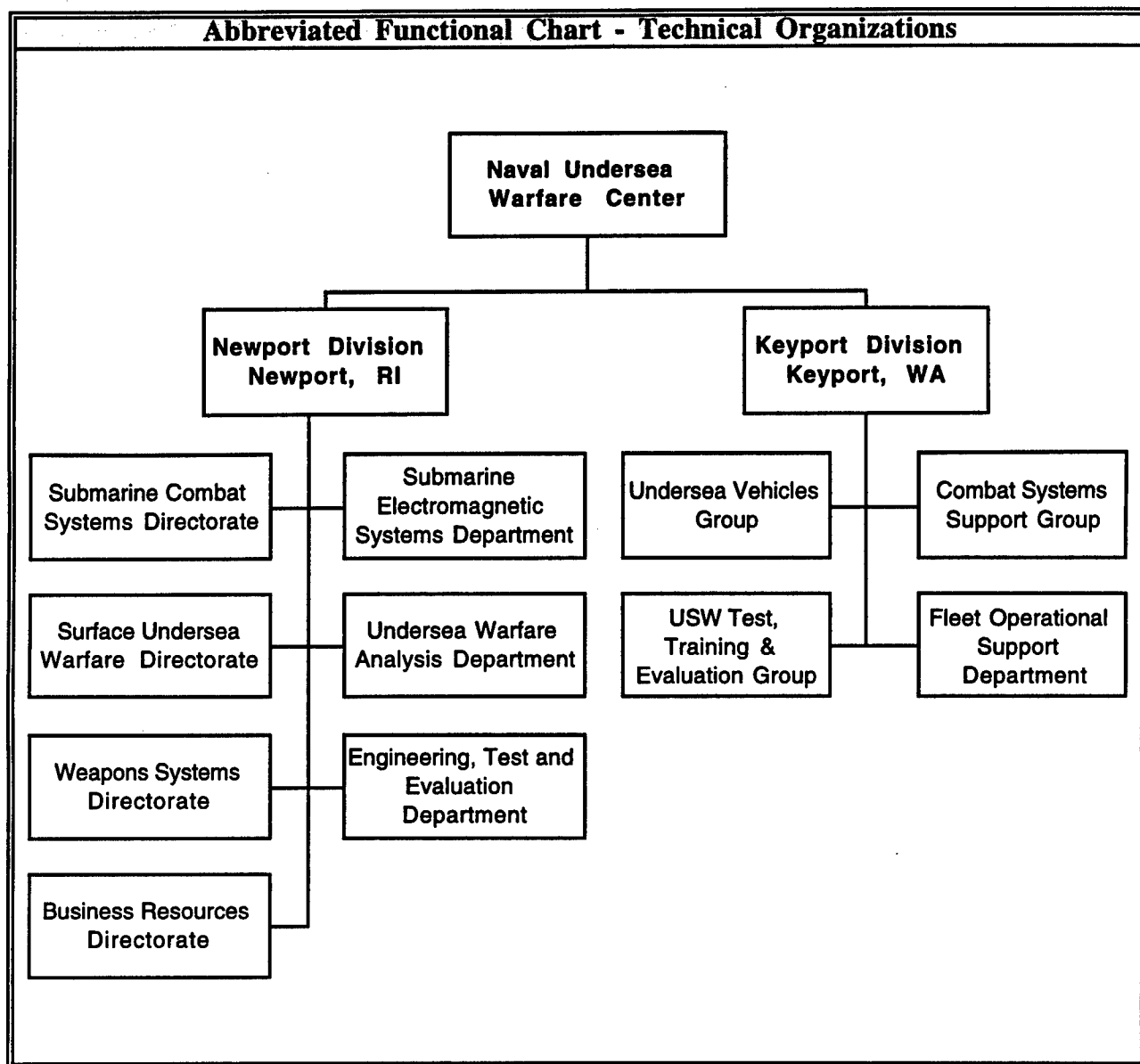
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	27.600

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	0	489	489
CIVILIAN	390	6,843	8,595	15,828
TOTAL	390	6,843	9,084	16,317

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	5,523.000	REAL PROPERTY	1,156.000
ADMIN	1,897.000	* NEW CAPITAL EQUIPMENT	38.800
OTHER	12,802.000	EQUIPMENT	802.800
TOTAL	20,222.000	* NEW SCIENTIFIC & ENG. EQUIP.	75.900
ACRES	71,767	* Subset of previous category.	

NA = Not Applicable

Naval Undersea Warfare Center



Naval Undersea Warfare Center
Newport, RI 02841-1708
(401) 841-6761

Commander: RADM John F. Shipway
Technical Dir.: Dr. John E. Sirmalis

MISSION

The Naval Undersea Warfare Center (NUWC) Mission promulgated by OPNAVNOTE 5450 Ser 09B22/1U510577 dtd 23 Dec 91 is as follows:

'Operate the Navy's full spectrum research, development, test and evaluation, engineering, and fleet support center for submarines, autonomous underwater systems, and offensive and defensive weapon systems associated with undersea warfare.'

CURRENT IMPORTANT PROGRAMS

SCIENCE AND TECHNOLOGY

The Naval Undersea Warfare Center conducts a comprehensive Science and Technology program in support of its mission that spans In-House Laboratory Independent Research (ILIR), Basic Research, Applied Research and participation in Advanced Technology Demonstrations. Current emphasis areas include:

- Submarine Combat Control - contact management, weapon targeting, engagement planning and advanced information management concepts;
- Submarine/Surface Ship Sonar - shallow water active classification, high gain systems, active surveillance systems, full signature processing, deployable surveillance systems;
- Torpedoes - propulsion and control systems, hydrodynamics/drag reduction, supercavitating technology noise reduction/acoustics, countermeasure technologies, UUV's, launchers; and advanced concepts;
- Submarine Communications - advanced submarine communications architectures, communication at speed and depth, mast antenna technology, and advanced Arctic communications.

UNDERSEA WARFARE MODELING AND ANALYSIS

- New USW Program Capability Assessment
- Analysis of Alternative (AOA)
- Investment Strategy Options Development
- Intelligence Data Assessment
- USW Requirements Analysis
- Derivation of USW Technology Goals
- Coordinated ASW Force Assessments
- Submarine and USW Synthetic Environments
- Battle Group Net Base USW
- Submarine System Engineering and Analysis
- SSN Tactical Development
- Test and Training Enabling Architecture

SUBMARINE, SURFACE SHIP AND AIR LAUNCHED TORPEDOES, TORPEDO/SONAR COUNTERMEASURES, UUVS, ASSOCIATED LAUNCHER SYSTEMS AND MISSILES

- Torpedo MK 48 / MK 48 ADCAP / ADCAP MODS Program
- Torpedo Mk 50 Program
- Torpedo MK 46 Program (with Service Life Extension Program)
- Lightweight Hybrid Torpedo Program
- Torpedo Mk 46/Mk 48 FMS Program
- Torpedo Alternate Fuels Program

CURRENT IMPORTANT PROGRAMS (continued)

- Mk 30 ASW Target Program
- Near Term Mine Reconnaissance System Program
- Long Term Mine Reconnaissance System Program
- ONR UUV Program
- ADC Mk 2/3/4 Countermeasure Program
- Affordable Common Countermeasure Program
- Tomahawk Cruise Missile (Submarine-Launched)
- Encapsulated Harpoon Weapon System
- Submarine Weapon Simulators and Test Vehicles
- Integrated Diagnostic Support System
- Submarine Torpedo Tubes
- SSN-21 Launcher Systems
- Turbine Pump Ejection Systems
- Submarine Weapon Handling
- SSN-688 Vertical Launch System
- Surface Ship Torpedo Tubes
- New SSN Launcher Systems
- Submarine External Countermeasure Launchers
- Submarine Internal Auxiliary Launchers
- Elastomeric Ejection Systems
- Submarine Advanced Launch Technology
- Adaptable High Speed Undersea Munitions
- Vertical Launch ASROC

SUBMARINE SONAR

- Acoustic Rapid COTS Insertion
- AN/BQQ-5
- AN/BQG-5 Wide Aperture Array
- TB-16F, -23 and -29 Submarine Towed Arrays
- Submarine Sonar Advanced Development
- AN/WLY-1 AN/WLR-9
- New SSN Sonar Subsystem
- AFTAS
- RATTRAP
- Sonar Advanced Development
- Transducer Tech Direction/Support Program
- AN/BSY-1 Acoustics
- Submarine Ancillary Sonar Systems
- Affordable Array Technology
- Ultra Thin Line Array
- Thin Optical Towed Array
- Acoustic Comms
- Submarine Safety (SUBSAFE) Program
- Multi-Chip Module Laboratory
- NATO FORACS AUTECH (NFA)
- Underwater Tactical Training Range Development
- AUTECH Hydrophone Replacement Program
- Tri-Service Signature Measurement and Database System
- Pinger Program
- Undersea Battlespace

CURRENT IMPORTANT PROGRAMS (continued)**SURFACE SHIP SONAR AND ASW SYSTEMS**

- AN/SQQ-89 ASW Combat System
- Multistatic Sonar
- Surface Ship Torpedo Defense -AN/SQR-19 Towed Array Sonar
- AN/SQS-53 A,B,C,D Active Hull Sonar
- AN/SQQ-28 Sonobuoy Processor
- KINGFISHER
- OK-520/SQQ Common Winch
- AN/SSN-2(V) Precise Integrated Navigation System
- AN/SYQ-13 Navigation, Command & Control System
- AN/SSQ-94 Combat System Integrated Training Equipment
- AN/WQN-1 Detecting-Ranging Set
- Echo Track/Target Classifier
- Shallow Water Active Detection Classification
- Surface Combatant 21st Century
- DD-21
- Lightweight Broadband Variable Depth Sonar
- Towed Active Receiving System (TARS)
- Sonar Insitu Mode Assessment System (SIMAS)
- Weapon System Accuracy Trails (WSAT) Program
- ASW Systems Consolidated Operability Test (SCOT) Program
- Carrier Tactical Systems Center
- AN/SQQ-30 Mine Classifying-Detecting Set
- AN/SQQ-32(V) Mine Hunting Sonar

SUBMARINE COMMUNICATIONS, ELECTRONIC WARFARE SUPPORT MEASURES (ESM), ELECTRO-OPTICS SYSTEMS/PERISCOPES

- Submarine Connectivity
- On-Hull Extremely Low Frequency (ELF) Antenna
- SHF High Data Rate (HDR) Phased Array Antenna Advanced Technology Demonstration
- Submarine High Data Rate (HDR) Antenna System
- OE-538 Multifunction Mast Antenna
- Submarine Integrated Antenna System (SIAS)
- Extremely Low Frequency (ELF) Communications
- Navy Extremely High Frequency (EHF) Satellite Communication Program (NESP)
- Submarine Communication Support System (SCSS)
- Integrated Electronic Support Measures (ESM) Mast (IEM)
- Advanced Submarine Tactical Electronic Combat System (ASTECS)
- AN/BST-1 Submarine Emergency Communications Buoy
- AN/WLR-8 High Probability of Intercept (HPI) Receiver
- Photonics Mast
- Electro-Optic Sensor Development and Acquisition
- Submarine Periscopes Program
- Submarine Shipboard Electromagnetic Compatibility Improvement Program (SEMCIP)
- EMC Advisory Boards (EMCAB)
- R&D Submarine Program
- Shallow Water Diesel Submarine Target

NEW SSN, SEAWOLF, LOS ANGELES AND TRIDENT CLASS SUBMARINE COMBAT, AND COMBAT CONTROL SYSTEMS

- NSSN
- AN/BSY-2, AN/BQG-5 Submarine Combat System
- Combat Control Systems MK 2

CURRENT IMPORTANT PROGRAMS (continued)

- Seawolf Non-Propulsion Electronics
- Trident Command and Control System
- Missiles: Combat Control
- Module Test and Repair Program
- Trainers
- Sensor Performance Computer Based Tactical Aids
- COMOPTEVFOR USW Trusted Agent
- Advanced Tomahawk Weapons Control System

UNDERSEA RANGES:

- Atlantic Undersea Test and Evaluation Center (AUTEC)
- Fleet Operational Readiness Accuracy Check Sites (FORACS)
- Tactical Underwater Range Development
- Southern California ASW Range
- SWIFT Tracking System
- Barking Sands Tactical Underwater Range Development
- Range Technology Development
- Dabob Bay Range Development and Operation
- NanOOSE Deep Water Tracking Range Development and Operation
- Quinault Shallow Water Range Development and Operation
- Hawaiian Island Underwater Range (HAIUR) Site
- San Clemente Island Underwater Range (SCIUR) Development and Operation
- Air Operations Post-operational Analysis Critique and Exercise Review (PACER)

METROLOGY AND MECHANICAL INSPECTION PROGRAM**TECHNOLOGY TRANSFER:**

The Naval Undersea Warfare Center conducts an extensive technology transfer program that is structured to make technology developed for defense purposes available to the academic and industrial communities. The main mechanics for technology transfer are:

o **Patent Program** - The Naval Undersea Warfare Center operates a highly efficient patent program believed to be the most productive in U.S. government (patents per scientist/engineer). In FY97, 170 invention disclosures were recorded, 123 patent applications were filed, and 96 patents were issued or allowed (76 patents and 20 classified allowances (D-10)). Some significant examples are:

- o Patent No. 5,632,218 - Debris Deflector Detection by a Threat Projectile
- o Patent No. 5,637,826 - Method and Apparatus for Optimal Guidance
- o Patent No. 5,654,937 - Acoustic Element Tester for an Array of Hydrophones
- o Patent No. 5,673,645 - Agile Water Vehicle

Cooperative Research and Development Agreements (CRADAs) - A CRADA is an agreement between one or more federal laboratories and one or more nonfederal parties. Under a CRADA, the government laboratories provide personnel, services, facilities, equipment or other resources with or without reimbursement (but not funds to nonfederal parties). The nonfederal parties provide funds, personnel, services, facilities, equipment or other resources toward the conduct of specified research and development efforts that are consistent with the missions of the laboratory. Significant CRADAs with NUWC include:

CURRENT IMPORTANT PROGRAMS (continued)

Lockheed-Martin - Explore and exploit massively parallel processing as applicable to sonar processing.

MedAcoustics, Inc. - Demonstrate signal-processing algorithms to process acoustic signals within the cardiac cycle.

Institut Supérieur d-Electronique - Investigate the physics of close-packed acoustic array element interaction phenomena.

Precision Signal, Inc. - Develop state-of-the-art equipment to map deep- and shallow-water ocean floors.

General Dynamics/Electric Boat Division - Further the development of Computational Fluid Dynamics to meet current and future Navy needs.

Connecticut Municipal Electric Energy Cooperative - Investigate electric vehicle electromagnetic interference, measurement and mitigation.

University of Maine - Develop a method of predicting the deformation of nets deployed in an ocean environment.

Lucent Technologies - Develop ultra-thin array technology.

Yale University School of Medicine - Bio-medical model development.

Loctite Corporation - Material property measurement.

Draper Laboratory - Co-development of unmanned underwater vehicle technology.

Foster-Miller, Inc. - Demonstrate low-cost, expendable bottom-crawling vehicles for ocean-bottom explorations.

Public Service Electric and Gas Co. - Material development, testing and evaluation for shielding capability in electromagnetic fields.

Rhode Island Technology Transfer Center - Technical assistance to Rhode Island's technically-based companies.

CytoTherapeutics, Inc. - Prototype packaging for medical devices using stereolithography.

Westfall Manufacturing Co. - Design verification and representation of a static fluid mixing device for water treatment processing.

Niche Medical, Inc. - Assistance in the design of a surgical smoke plume collector.

Deep Creek Technology, Inc. - Assistance with the integrated diagnostics support system.

Michigan State University - Development and application of controllable fluids.

Automata, Inc. - Assistance with the integrated diagnostics support system.

Western Geophysical - Very low frequency projector technology.

Dr. Alan Semine - Medical image processing for breast cancer.

Flight Safety Technologies, Inc. - Modeling and simulation of the acoustic signature of atmospheric disturbances.

Connecticut Technology Associates, Inc. - Technical assistance to the State of Connecticut's technological companies.

TRACOR Corporation - Develop a graphical Environmental Management Information System (EMIS) to track hazardous materials and hazardous waste.

Virtual I/O, Inc. - Develop head-mounted display system hardware and software for military applications including shipboard systems battlefield training simulations.

4-Cycle, Inc. - Develop conversion kits for small, high-output internal combustion 2-cycle and 4-cycle engines.

Economic Development Council of Kitsap County - Foster technology transfer between NUWC Division, Keyport and small businesses in the Kitsap County, WA, region.

Sound Ocean Systems, Inc. - Develop deep diving (to 6000 meters) recovery capability with flexible attachments capable of performing a wide variety of tasks.

CURRENT IMPORTANT PROGRAMS (continued)

o **Educational Partnership Agreements (EPA's)** - Education Partnership Agreements are authorized for defense laboratories. Those laboratories may enter into one or more such Agreements with educational institutions in the United States, including local education agencies, colleges, universities and nonprofit institutions that are dedicated to improving science, mathematics and engineering education, for the purpose of encouraging and enhancing study in scientific disciplines at all levels of education. NUWC EPAs include:

Oceansciences, Inc. - to provide undersea science and technology educational guidance and assistance for an ocean sciences camp and museum to further math and science education.

The University of Massachusetts - to aid in the undersea science and technology education of students and faculty.

Yale University - to aid in the fluid mechanics, acoustics, and mathematics education of students and faculty.

The University of Rhode Island - to aid in the ocean science, engineering, technology, and policy applications of these disciplines to encourage student interest in these areas.

The University of Massachusetts/Lowell, Institute for Plastics Innovation - to encourage student interest in the low-density extruded plastic materials applications of their individual disciplines.

Rutgers, the State University of New Jersey - to aid in the ocean science, engineering, technology, and policy applications of these disciplines to encourage students interest in these areas.

EQUIPMENT/FACILITIES

The Naval Undersea Warfare Center maintains and continuously improves numerous facilities on both coasts designed to support the Research, Development, Test, and Evaluation of Undersea Warfare (USW) systems.

NUWC DIVISION, NEWPORT

On the Atlantic Coast, NUWC Division, Newport, RI, facilities are grouped into 9 major complexes:

UNDERSEA WARFARE ANALYSIS COMPLEX

This complex has developed and maintains a suite of USW models, databases and U.S. and foreign weapon system hardware-in-the-loop simulations. These are exercised in support of requirements analysis, tactical development, concept development and performance assessment from system level through force and theater levels. This complex comprises two components:

The Undersea Warfare Analysis Laboratory (USWAL) component consists of distributed computer servers linked together via a high speed network and tied to a centralized file server. This architecture, combined with an intelligent queuing system provides the USWAL with a specialized simulation environment that outperforms the combined power of multiple supercomputers. The Weapons Analysis Facility (WAF) simulation component provides a massively parallel processing synthetic environment which integrates a variety of actual weapon hardware and software within its specialized architecture. Thus, real weapons are allowed to perform mission scenarios in the highest fidelity virtual environment the U.S. Navy has developed. The combined computing engines in this complex achieve a maximum throughput exceeding 40 GigaFlops.

EQUIPMENT/FACILITIES (continued)**SUBMARINE COMBAT SYSTEMS COMPLEX (SCSC)**

This complex is a unique set of 4 world-class facilities that combine leading-edge synthetic environment and analysis technology with submarine tactical system hardware representing current and future combat systems in a networked laboratory setting. Linked and interconnected with other NUWC and external government, private industry and university facilities, the complex provides expanded virtual environments for conducting research and development (R&D) in technical and operational problems confronting the submarine force. Areas of R&D include information management, weapon employment, joint operability, battle group interoperability and battle space management. SCSC's facilities are available for use by government organizations, private industry, and academic institutions.

SONAR COMPLEX

This complex is a unique set of 6 facilities that include platform independent and federated laboratories and robust simulation and stimulation used to explore the underlying science and technology common to submarine and surface ship sonars. These facilities encompass the research, development and test of acoustic sensors, transducers, and arrays for use in tactical, calibration and standards applications at sites ranging from laboratory test beds and large scale pressure vessels to inland lakes and ponds. This complex provides the Navy with the capability to explore the technologies and science associated with transduction materials, fiber optics, environmental acoustics, and measurement and analysis techniques, leading to development of hull mounted, towed, and expendable sensors and arrays. Sonar systems laboratories consist of specialized sites for the investigation of signal processing, operator displays, detection and classification algorithms, acoustic communication, acoustic intercept, system architecture, onboard trainers, and commercial off-the-shelf applications utilizing robust simulation/stimulation capabilities to perform system evaluation, performance analysis and life cycle support.

SUBMARINE ANTENNA TEST COMPLEX

This complex of four facilities permits full characterization of submarine exterior communications, electronic and imaging warfare systems and their related antennas/sensors by using unique laboratories and in-the-field test facilities. Stimulation/simulation equipment that replicates advanced radio frequency (RF) emitters, specialized test equipment, and RF anechoic chambers provides highly accurate measurement of systems baseline performance, transmit and receive patterns, and radar cross section signatures. An Overwater Arch in Newport, RI, and a remote, electromagnetically quiet, test site on Fishers Island, NY, are used to measure systems performance with antennas/sensors operating in the sea water environment simulating actual submarine operations.

SUBMARINE LAUNCHER SYSTEM TEST AND EVALUATION COMPLEX

This complex is a unique array of 5 major facilities dedicated to full spectrum support to submarine launcher programs for weapons, vehicles, and countermeasures from submarines. The facilities provide the capabilities for evaluating new launcher developments and improvements, land-based acceptance testing, and troubleshooting Fleet problems. The Transient Flow, Impeller Test Facilities are the only known facilities in the world capable of conducting hydrodynamic and hydroacoustic tests of transient flows and torpedo ejection pumps. The Submerged Launcher Test Facility replicates full-scale launch systems on SSN-688 and SSBN-726 class submarines and is capable of firing dummy weapons at simulated depths from surface to submarine test depth. Dual ejection capability allows for concurrent, side-by-side firing comparisons of any two current or future candidate ejection systems. The Advanced Submarine Launcher Facility replicates the full-scale launch system on SSN-21 and is capable of launch system performance testing and measuring radiated sound pressure levels in a unique Ocean Simulation Tank.

EQUIPMENT/FACILITIES (continued)**WEAPONS DEVELOPMENT FACILITY COMPLEX**

This complex includes 7 major facilities for design, development, test, and life cycle support of Navy torpedoes, countermeasures, unmanned undersea vehicles, and undersea targets. Torpedo and other vehicle system designs are developed and maintained in the complex's state-of-the-art UUV, Target, Torpedo R&D Facility. Its Propulsion Test Facility supports electric and thermal (open and closed cycle) propulsion system developments and includes the Deep Depth Propulsion Test Facility, the only land-based facility capable of testing entire torpedoes to maximum power and depth; a total containment High Energy Chamber, designed to contain the total energy content of advanced propulsion systems in an environmentally safe manner; and the Propulsion Noise Test Facility, the only land-based facility capable of measuring radiated noise of operational underwater vehicles on land. The complex also includes the world's quietest anechoic wind tunnel, a 64,000 cubic foot anechoic chamber, the largest Reverberant Acoustic Tank of its kind in the country, the Navy's only large scale sea-water tow tank (3000 feet long) and an advanced materials laboratory, all of which provide comprehensive hydrodynamic, structural and acoustic data on components, as well as on full systems. Development and evaluation of vehicle sonars, guidance and control systems and software are accomplished in the unique Torpedo Life Cycle Support Facility. It includes undersea vehicle testbeds, allowing the capability to integrate new software with vehicle guidance and control hardware and test it under simulated in-water operating conditions.

ATLANTIC UNDERSEA TEST & EVALUATION CENTER (AUTEC)

AUTEC is a comprehensive open ocean test and evaluation complex located in the ocean waters off Andros Island in the Bahamas. The AUTEC ranges allow testing of aircraft, surface ships, and submarines in an instrumented, calibrated 230-square-mile ocean area with precision tracking in three dimensions of all platforms. AUTEC also provides measurement systems for basic acoustic, environmental, and oceanographic research and test programs. As part of the AUTEC complex, there is a shallow-water OPAREA that consists of a minefield adjacent to a 90 square-mile ocean area with precision tracking in three dimensions of all platforms. The real-time positional information can be displayed on location or linked back to one of AUTEC's display centers at Andros or West Palm Beach. There is also a Portable Tracking System (50 nmi) that can be deployed in OPAREAs of opportunity and provides three dimensional precision tracking of all platforms. AUTEC's facilities are available for use by U.S. and allied foreign government organizations, private industry, and academic institutions.

LITTORAL UNDERSEA WARFARE COMPLEX

The complex is a unique combination of test and tracking facilities and test environments in the Northeast. These facilities and environments represent potential areas of regional conflict (Persian Gulf, Gulf of Oman, coast of Korea) and have been well characterized, contain baseline performance data on existing systems, and can be supported cost effectively by nearby shore activities. The unique Gould Island Elevator/Launch System, deep water piers, and test areas immediately adjacent to NUWC Division, Newport are especially effective for testing systems in shallow water in an effective and affordable manner. Also, the decommissioned diesel submarine USS SALMON provides sonar targets for development of new systems and acts as a training aid for submarines transiting the area aiding in detection and classification of bottom targets.

SHIPBOARD ELECTRONIC SYSTEMS EVALUATION FACILITIES (SESEF)

The primary purpose of the SESEF is to improve Fleet readiness by providing Fleet units with an operational and material evaluation of all shipboard electromagnetic radiating and receiving systems. NUWC Division, Newport operates and maintains one SESEF site, located in Norfolk, Virginia.

EQUIPMENT/FACILITIES (continued)**SUBMARINE PERISCOPE COMPLEX**

This complex is a unique combination of 8 facilities that provides full spectrum support for the development, test, evaluation, and in-service engineering for current and future submarine, periscopes and imaging systems. Facilities include the Trident Periscope Facility, Special Mission Electro-Optic Sensor Support Facility, Periscope Regional Maintenance Facility, EHF SATCOM Development Terminal, Emsort Development and Support Facility, Photonics Mast Land Based Test Site, Imagery Archive and Video Editing Facility, and Periscope Engineering RDT&E Facility.

NUWC DIVISION, KEYPORT

On the Pacific coast, NUWC Division, Keyport, WA, maintains and operates a variety of testing and engineering equipment and facilities to support their mission of providing test and evaluation, in-service engineering, maintenance and repair, fleet support, and industrial base support for undersea weapons systems, countermeasures, and sonar systems. Major facilities for NUWC Division, Keyport include:

NORTHWEST RANGE COMPLEX

There are three unique, highly instrumented test sites in NUWC Division, Keyport's Northwest Range complex, with over 100 square miles of littoral and mid-depth underwater tracking area, including inshore shallow water sites. While these sites are principally underwater test ranges, they also have extensive surface and in air tracking capability. Water depths, specialized instrumentation, bottom recoverability, acoustic quietness, and security factors facilitate a wide range of undersea warfare vehicle and platform tests from research and development tests to production acceptance tests and Fleet evaluation/exercises. All range sites are linked to the Range Information Display Center (RIDC) at Keyport, explained below. The Northwest Range sites include Dabob Bay, Nanoose, and Quinault. Both Nanoose and Dabob Bay are used extensively for development tests due in part to the capability to recover one-of-a-kind test vehicles intact, even if they sink.

The **NANOOSE RANGE** site is jointly operated and maintained on a shared basis by the United States and Canada and is located in the Strait of Georgia near Vancouver Island in British Columbia, Canada. Canada provides extensive range craft support and facilities at no cost to the United States. Nanoose is an excellent site for countermeasure testing because of its robust, short-baseline tracking configuration, which has the capability to track while most countermeasures are in use.

The **DABOB BAY RANGE** site is located in Hood Canal near Naval Submarine Base, Bangor, and is among the quietest and most secure instrumented underwater range sites in the world. This is especially important in the testing of new, quiet, and leading-edge technologies which are under development.

The **QUINAULT RANGE** site is approximately 10 miles off the coast of Washington State and offers a fully-instrumented, shallow underwater environment. It meets the NATO 40-meter shallow water requirement and can provide support for the expanding shallow water antisubmarine warfare emphasis, including mine warfare testing and training.

RANGE LAUNCH, RECOVERY, AND TARGET VESSELS

Yard Torpedo Test (YTT) craft are an integral part of the range operations for both U.S. and Canadian ranges. These unique, highly specialized vessels provide launch, fire control, and bottom recovery for the full spectrum of the Navy's undersea weapons, targets, and countermeasures. The YTT's were built specifically for use at the Northwest Range. The ability of specially designed torpedo recovery systems installed on these craft to recover, intact and undamaged, torpedoes that have become embedded in the soft mud bottoms of the Northwest Range is a unique Navy asset. Smaller support craft satisfy other specialized range needs such as surface retrieval, acoustic measurement, and target deployment.

EQUIPMENT/FACILITIES (continued)**RANGE INFORMATION DISPLAY CENTER (RIDC)**

The RIDC facilitates efficient range operations by minimizing travel to the range sites. Using large screen video and associated monitors, it provides encrypted real-time displays and fusion of range data (tracking, acoustics, and telemetry, plus two-way video and secure communications) from all Northwest Range sites.

UNDERSEA WEAPON EVALUATION FACILITY (UWEF)

The UWEF is a hardware-in-the-loop test system which permits land-based captive testing of undersea weapons and other vehicles operating under their own power in a land-based water-filled test chamber.

SHIPBOARD ELECTRONIC SYSTEMS EVALUATION FACILITIES (SESEF)

The primary purpose of the SESEF is to improve Fleet readiness by providing Fleet units with an operational and material evaluation of all shipboard electromagnetic radiating and receiving systems. NUWC Division, Keyport operates and maintains three SESEF sites, located in Southern California at Point Loma, San Diego; in MIDPAC at Barbers Point, Hawaii; and in PACNORWEST at Ediz Hook, Port Angeles, Washington.

UNDERSEA WEAPONS REPAIR AND MAINTENANCE DEPOT

This highly specialized state-of-the-art complex is the Nation's only defense repair and maintenance depot for the Navy's full arsenal of developmental, in-service and retiring undersea weapons, torpedoes, mobile mines, and targets. This complex consists of specialized weapons shops, repair facilities, and testing laboratories. Since depot repair processes require responsible handling of hazardous materials, wastes, and explosive components, unique explosive handling and environmental storage equipment and facilities have been developed. Special environmental equipment and facilities are on-line to handle the decontamination, storage, reclamation and disposal of hazardous materials such as OTTO fuel II and lithium.

TORPEDO EXPLOSIVE OPERATING COMPLEX

The complex includes eight buildings for the explosive assembly, disassembly and repair of all undersea weaponry currently in the active U.S. Navy inventory. This complex has been sited within the same Explosives Safety Quantity Distance arcs as their adjacent torpedo storage magazines.

TORPEDO STORAGE MAGAZINES

These 72 specially constructed magazines constitute the Navy's only resource for consolidation of torpedoes being laid-up or 'bunkered' as a result of reductions in Fleet platforms. The U.S. Navy's entire MK 48 torpedo inventory and approximately one half of the MK 46 torpedo inventory will be bunkered over the next few years. These magazines are dedicated to torpedo storage and as such, represent the only explosive torpedo storage facilities available to accommodate the thousands of torpedoes to be bunkered.

WEAPON ACCEPTANCE AND OPERATIONAL TEST FACILITY

Provides data reduction and analysis for R&D testing, Operational Testing (conducted by COMOPTEVFOR), and weapon acceptance testing (Proofing) for underwater weapons and vehicles.

HARDWARE ENVIRONMENTAL TEST FACILITY

This facility consists of four test laboratories, each specifically equipped for one of the four major test functions of dynamic/climatic testing, mechanical testing, electrical testing, and explosive testing. The primary role of these facilities is testing Naval undersea weapons, targets, mines, countermeasures, and combat systems, but the facility also supports other weapon systems, government agencies, and commercial activities.

EQUIPMENT/FACILITIES (continued)**COMBAT SYSTEMS FACILITY**

This facility was designed and built in 1994 specifically to meet the needs of operational Combat Systems. This facility includes integrated labs comprised of Fast Attack Submarine (SSN) Combat Systems, Fleet Ballistic Missile Submarine (SSBN) Combat Systems, Aircraft Carrier Tactical Systems Center, and ancillary equipment. The installed Fleet hardware provides a means for the test and evaluation as well as in-service system supportability for the Fleet.

TARGET MK 30 IMAS, AND RANGE TRACKING PINGER IMAS

Target turnaround facilities are located at Barking Sands, Kauai, Hawaii, North Island, San Diego, California, and Keyport, Washington. Pinger facilities are located at Lualualei, Oahu, Hawaii; North Island; and Keyport. The Navy's only pinger repair depot is located with the pinger IMA at Lualualei.

TRANSDUCER AUTOMATED TEST FACILITY

Acoustic tests are conducted in a 30-foot diameter by 30-foot deep, freshwater filled, redwood tank. A four-foot diameter, acoustically transparent, graphite-epoxy pod is available for transducers acoustically while being subjected to pressures of up to 2,000 pounds per square inch.

ACOUSTIC TEST FACILITY (ATF)

Acoustic transducer calibrations are performed in sea water, approximately 30 feet deep at this floating facility which is moored to a pier on the NUWC Division, Keyport waterfront. Precision fixtures and automated instrumentation provide efficient calibrations of a wide variety of underwater acoustic devices, including torpedo and target simulator transducers, and underwater range instrumentation. ATF calibration is part of many torpedo and mobile target depot repair and ORDALT processes.

UNDERWATER NOISE ANALYSIS FACILITY (UNAFAC)

Comprised of state-of-the art signal playback, processing, and analysis systems used in the assessment of the acoustic performance of torpedoes, countermeasures, acoustic targets, and other underwater vehicles.

MIDPAC RANGE COMPLEX

This range complex consists of the Hawaiian Island Underwater Range (HAIUR), the Hawaiian Area Tracking System (HATS), Fleet Operational Readiness Accuracy Check Site III (FORACS III), and Surface Ship Radiated Noise Measurement (SSRNM) test facilities. All areas except HATS are located within 20 nautical miles of Pearl Harbor, on the western coast of the island of Oahu, Hawaii. HAIUR is instrumented with a long baseline, asynchronous tracking system and offers depths from 2500 ft to 3500 ft. HATS, located near the island of Maui, has a nominal water depth of 600 ft and is instrumented with a shallow water, long baseline, tracking system. The Range System provides test and evaluation support for NAVSEA-sponsored RDT&E programs and the Fleet. The Barbers Point Shipboard Electronic Systems Evaluation site (SESEF) cited earlier is part of this MIDPAC complex as well.

SOCAL RANGE COMPLEX

This facility is located in the San Diego, California area at San Clemente Island. The range system consists of the San Clemente Island Underwater Range (SCIUR), Surface Ship Radiated Noise Measurement (SSRNM), and Fleet Operational Readiness Accuracy Check Site I (FORACS I). This site offers a long baseline, asynchronous tracking system with depths to 3900-ft. Surface and air tracking, as well differential GPS capabilities are also provided.

EQUIPMENT/FACILITIES (continued)**RAPID PROTOTYPING AND FABRICATION FACILITIES**

A wide variety of state-of-the-art equipment, fabrication techniques, and processes are available for prototype in support of RDT&E and emergent Fleet requirements.

Other facilities operated by NUWC Division, Keyport in support of RDT&E programs include: Material, Chemical and Failure Analysis Laboratories; Mechanical and Electronic Repair and Assembly Facilities; Industrial Waste Treatment Facility; Recycling Facility; Hyperbaric Chamber; Post-operational Analysis Critique and Exercise Review (PACER) Facility; and Navy Mine Depot Hawthorne, NV.

Naval Undersea Warfare Center
Newport, RI 02841-1708
(401) 841-6761

Commander: RADM John F. Shipway
Technical Dir.: Dr. John E. Sirmalis

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	1.664	NA	NA	1.664
6.1 Other	2.936	NA	0.600	3.536
6.2	19.300	NA	7.000	26.300
6.3	6.200	NA	9.800	16.000
Subtotal (S&T)	30.100	NA	17.400	47.500
6.4	36.400	NA	32.800	69.200
6.5	51.400	NA	27.100	78.500
6.6	42.100	NA	11.900	54.000
6.7	23.400	NA	17.200	40.600
Non-DOD	0.000	NA	0.000	0.000
TOTAL RDT&E	183.400	NA	106.400	289.800
Procurement	114.400	NA	177.600	292.000
Operations & Maintenance	81.700	NA	79.700	161.400
Other	47.800	NA	51.900	99.700
TOTAL FUNDING	436.000	NA	415.600	851.600

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	30	53	83
CIVILIAN	137	2,338	2,018	4,493
TOTAL	137	2,368	2,071	4,576

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	3,006.000	REAL PROPERTY	288.085
ADMIN	351.000	* NEW CAPITAL EQUIPMENT	2.008
OTHER	2,864.000	EQUIPMENT	609.954
TOTAL	6,221.000	* NEW SCIENTIFIC & ENG. EQUIP.	18.972
ACRES	3,242	* Subset of previous category.	

NA = Not Applicable

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DEPARTMENT OF THE AIR FORCE



DEPARTMENT OF THE AIR FORCE

The Air Force’s seven (7) In-House RDT&E Activities are:

Armstrong Laboratory4-2

Arnold Engineering Development Center4-6

Development Test Center4-10

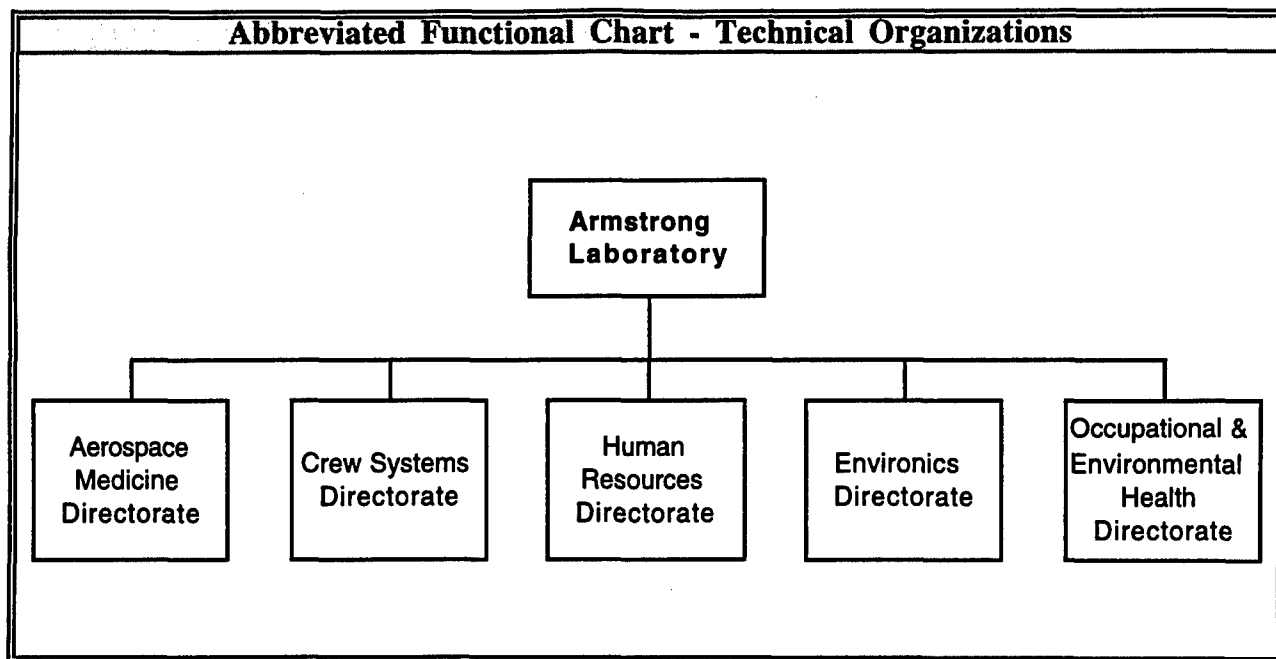
Flight Test Center4-16

Phillips Laboratory4-22

Rome Laboratory4-26

Wright Laboratory4-30

Armstrong Laboratory



Armstrong Laboratory
Brooks AFB, TX 78235-5118
(210) 536-3234

Director: Dr. Brendan B. Godfrey
Deputy Director: Col Terence J. Lyons

MISSION

Advance and apply technology to provide the Air Force with superior capabilities in the areas of human resources, crew systems, aerospace medicine, environics, and occupational/environmental health through integrated execution of research, development, and operational support. Sponsor and conduct research and development in the fields of biodynamics, biocommunications, environmental compliance, site restoration, toxic hazards, radiation/directed energy bioeffects, aeromedical selection/retention, human engineering, crew protection/life support, logistics and human factors, force acquisition and management, job skill development and retention, instructional strategies, and training devices.

CURRENT IMPORTANT PROGRAMS

The resources of the Armstrong Laboratory are organized into five integrated 'thrusters' which bridge specific research programs and projects. Technical thrust areas are: crew systems; human resources; aerospace medicine; occupational and environmental health; and environmental quality. The Armstrong Laboratory is also host to 'Tri-Service Research Centers' in toxicology and directed energy, created in accordance with the Project Reliance initiative for DoD laboratory consolidation. The principle types of technology transferred to commercial industry by Armstrong Laboratory are: environmental compliance and remediation, intelligent training, human safety standards and equipment, health care, logistics and human performance enhancement.

EQUIPMENT/FACILITIES

The Armstrong Laboratory conducts S&T at Wright-Patterson AFB OH, Brooks AFB TX, Tyndall AFB FL, and Mesa AZ. Equipment and facilities include: Two human centrifuges, a high on-set rate centrifuge located at Brooks AFB and a multi-axis centrifuge located at Wright-Patterson AFB; hypobaric and hyperbaric chambers with capability to simulate high altitude subzero conditions; anechoic chambers for study of human and noise interactions; 'virtual worlds' for systems and training research; inhalation toxicology chambers; directed energy laboratory to research bioeffects of lasers and RF radiation; human isolation facility for controlled study of group dynamics in simulated air operations; a TEMPEST secure facility with simulators for EW research and training; a facility for testing subjects (mostly new recruits) in S&T of computer automated training and force management tools; energetics research facility at Tyndall AFB with highly specialized research equipment to study the dynamic effects of contaminants on air and groundwater to include: a model aquifer for tracking groundwater plumes, an environmental spherical chamber for studying atmospheric fate and transport of contaminants, and a perfusion chromatograph system for separation of environmental macromolecules.

Armstrong Laboratory
Brooks AFB, TX 78235-5118
(210) 536-3234

Director: Dr. Brendan B. Godfrey
Deputy Director: Col Terence J. Lyons

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	2.907	0.328	5.246	8.481
6.2	52.066	3.548	31.207	86.821
6.3	5.081	2.528	56.147	63.756
Subtotal (S&T)	60.054	6.404	92.600	159.058
6.4	2.246	0.000	3.348	5.594
6.5	0.000	0.061	24.682	24.743
6.6	0.000	0.000	0.029	0.029
6.7	0.000	0.000	0.000	0.000
Non-DOD	1.780	0.000	0.108	1.888
TOTAL RDT&E	64.080	6.465	120.767	191.312
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.000	NA	0.000	0.000
Other	2.571	NA	14.480	17.051
TOTAL FUNDING	66.651	6.465	135.247	208.363

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

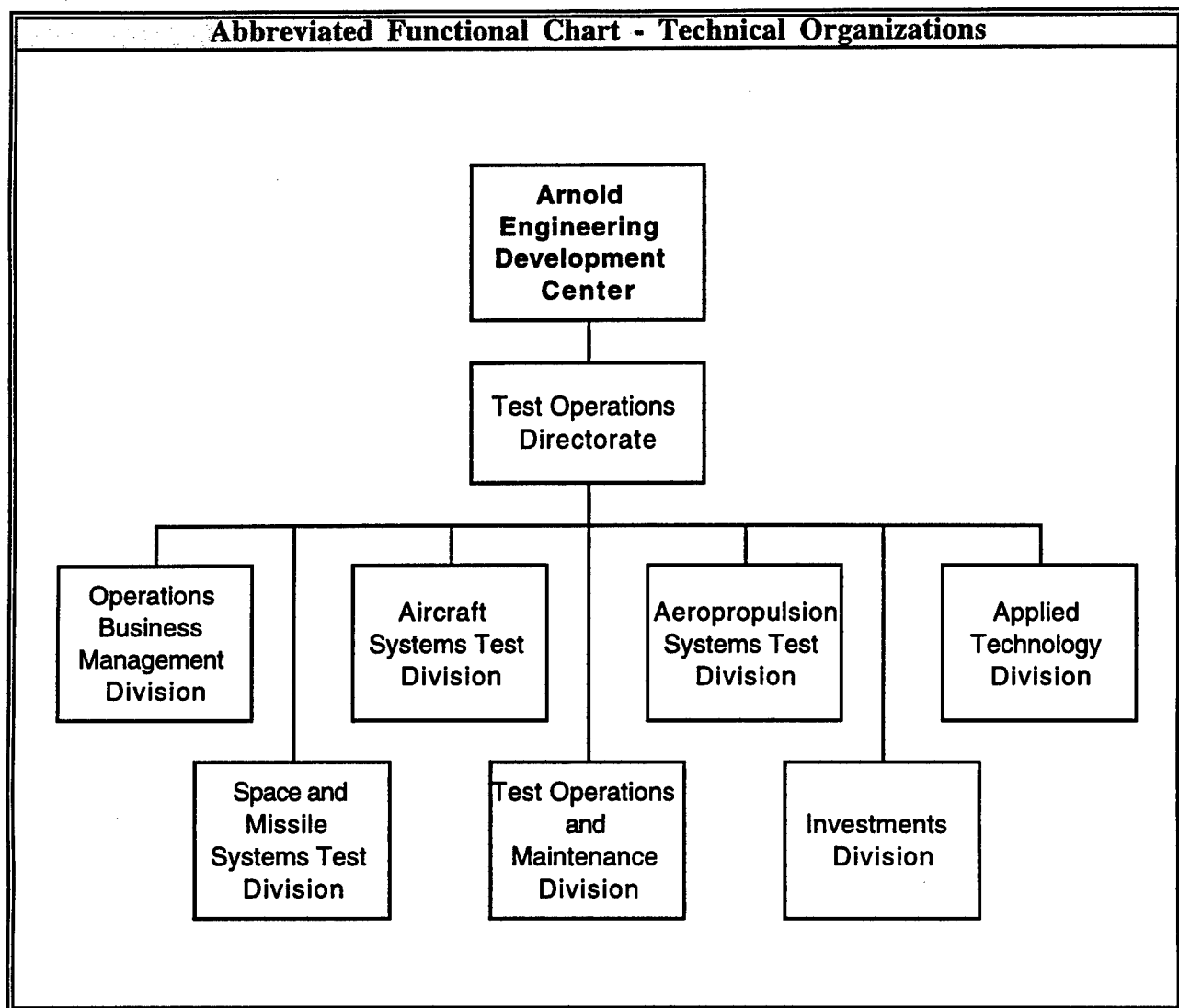
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	91	179	422	692
CIVILIAN	140	218	414	772
TOTAL	231	397	836	1,464

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,034.000	REAL PROPERTY	64.860
ADMIN	157.000	* NEW CAPITAL EQUIPMENT	0.308
OTHER	1.000	EQUIPMENT	74.116
TOTAL	1,192.000	* NEW SCIENTIFIC & ENG. EQUIP.	3.016
ACRES	96	* Subset of previous category.	

NA = Not Applicable

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Arnold Engineering Development Center



Arnold Engineering Development Center
Arnold AFB, TN 37389-5000
(615) 454-3000

Commander: Col Robert W Chedister
Executive Director: John M. Rampy

MISSION

The AEDC mission is to:

- (1) Test and evaluate aircraft, missile, and space systems and subsystems at the flight conditions they will experience during a mission to: help customers develop and qualify the systems for flight, improve system designs and establish performance before production, and to help users troubleshoot problems with operational systems.
- (2) Conduct research and technology programs to develop advanced testing techniques and instrumentation, and to support the design of new test facilities. The continual improvement helps satisfy testing needs and keeps pace with rapidly advancing aircraft, missile, and space system requirements.
- (3) Maintain and modernize the Center's existing test facilities.

CURRENT IMPORTANT PROGRAMS

The following list contains some of the more important test programs at the Arnold Engineering Development Center:

F-22 Fighter: Wind tunnel testing and analysis accomplished supporting the engineering/manufacturing/development phase; majority focused on store separation testing.

F119 Engine for F-22: Significant testing completed on altitude development and ram accelerated mission test qualification supporting the initial flight release, the first flight milestone, and development of the engine towards initial service release milestone.

F-15 Fighter: Weapons separation test and analysis completed for a number of stores.

F100 Engine for F-15 and F-16: Component improvement program testing conducted on two F100 models. Altitude development and qualification testing of redesigned components for both the F100-PW-220 and F100-PW-229 performed to overcome performance and durability problems. New hardware evaluated on 3rd stage fan blades, 4th stage low-pressure turbine blades, and fuel manifold and afterburner components.

F-18 Fighter: Store separation testing conducted on the E/F version of the aircraft.

Joint Strike Fighter: Testing accomplished for both competing contractors.

F119 Engine for Joint Strike Fighter: Pre-test planning, coordination, and test cell modifications accomplished in preparation for the FY98-99 testing of the two competing propulsion system candidates.

JASSM: Wind tunnel testing conducted on both competing weapon versions in support of downselect.

JDAM: Testing in support of time critical weapon modifications.

CURRENT IMPORTANT PROGRAMS (continued)

F414 for F/A-18E/F: Altitude test program completed in support of the limited product qualification milestone.

Evolved Expendable Launch Vehicle: Provided simulated altitude test services for the RL-10B-2 upper-stage engine to be used on the Boeing Delta III and Delta IV launch vehicles. Also, provided the vacuum environment to demonstrate the separation and dynamic motion of the vehicle payload fairing to protect the payload from aerodynamic and thermal environments during launch.

Peacekeeper Intercontinental Ballistic Missile (ICBM): Provided simulated altitude test services for aging surveillance of the Post Boost Propulsion System.

Minuteman III ICBM: Provided simulated altitude test services for aging surveillance of the second and third stage solid rocket motors. Also, hosted the historical technical database for the Propulsion System Rocket Engine.

Minuteman III Propulsion Replacement Program: Provided simulated altitude test services for development of the replacement second and third stage solid rocket motors.

Ground Based Interceptor: Calibrated and tested the sensor and focal planes using target simulation packages traceable to national standards. Evaluated in a vacuum, cryogenic environment that closely simulated their actual operating conditions.

EQUIPMENT/FACILITIES

AEDC represents a \$6 billion investment in the most advanced and largest complex of flight simulation facilities in the world with test units having capabilities unmatched elsewhere. AEDC encompasses 3 main business areas: Turbines, Aerodynamics, and Space and Missiles.

The Turbine Business Area includes 11 turbine engine test cells supporting aircraft and missile system research and development simulating flight tests over a wide range of Mach numbers and altitudes to determine operational characteristics of air breathing propulsion systems. Test capabilities include engine performance and operability, engine/inlet integration, and environmental/climatic testing. Unique military requirements supported include afterburner use, high altitude flight, high speed low altitude flight, maneuverability, fighter/bomber engine/inlet integration, and environmental testing.

The Aerodynamics Business Area includes 7 wind tunnels (conventional, continuous-flow, and intermittent blowdown) supporting flight simulation, store separation simulations, computational fluid dynamics, and engineering approximations of relatively large-scale models of high speed aircraft, missiles, and spacecraft. Unique military requirements supported include high performance fighter flight simulations, full scale engine/inlet/exhaust testing, and store separation simulations.

The Space and Missile Business Area includes altitude rocket facilities, propulsion research test cells, aerospace chambers, continuous flow arc-heated facilities, and free-flight ranges providing test capabilities for rockets, spacecraft, and hypersonic/re-entry systems. Unique military requirements supported include large solid and liquid rocket altitude tests, high speed impact/counter fire, high speed large model launches, soft model recovery, digitally controlled scene generation, and multi-functional focal plane array.

Arnold Engineering Development Center
 Arnold AFB, TN 37389-5000
 (615) 454-3000

Commander: Col Robert W Chedister
 Executive Director: John M. Rampy

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	249.146	1.351	27.018	277.515
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	249.146	1.351	27.018	277.515
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	3.015	NA	6.770	9.785
Other	7.544	NA	2.006	9.550
TOTAL FUNDING	259.705	1.351	35.794	296.850

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	3.885

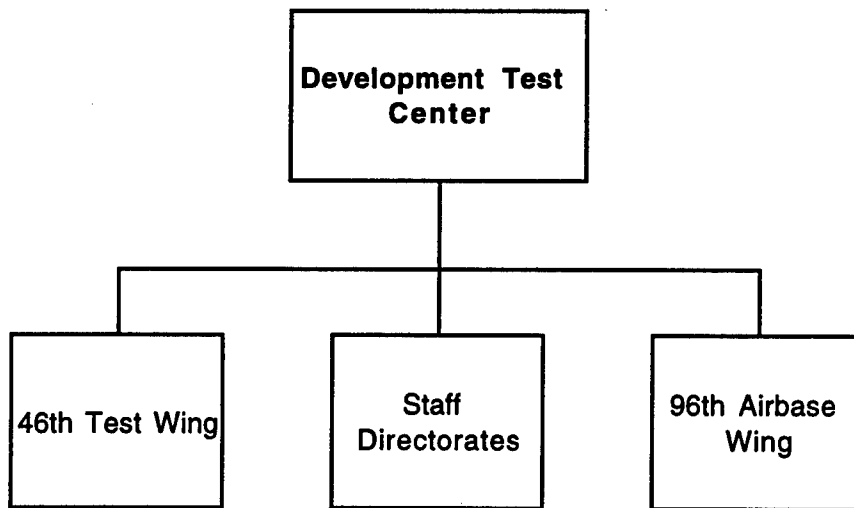
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	40	68	108
CIVILIAN	4	59	130	193
TOTAL	4	99	198	301

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,063.600	REAL PROPERTY	1,341.962
ADMIN	386.200	* NEW CAPITAL EQUIPMENT	1.500
OTHER	1,449.800	EQUIPMENT	226.156
TOTAL	2,899.600	* NEW SCIENTIFIC & ENG. EQUIP.	17.282
ACRES	39,081	* Subset of previous category.	

NA = Not Applicable

Development Test Center

Abbreviated Functional Chart - Technical Organizations



Development Test Center
Eglin AFB, FL 32542-5498
(850) 882-3931

Commander: MG Stewart E. Cranston
Exec. Director: Dr. J. Daniel Stewart

MISSION

The Air Force Development Test Center (AFDTC) plans, directs and conducts test and evaluation of US and allied non-nuclear munitions and navigation/guidance systems. AFDTC operates the largest air base in the free world, providing host support to 50 tenant units, and supports the largest single base mobility commitment in the Air Force. The Test Center accomplishes its mission through its two component wings - the 46th Test Wing and the 96th Air Base Wing.

CURRENT IMPORTANT PROGRAMS

Advanced Medium Range Air-to-Air Missile* - T&E includes flight test and hardware-in-the-loop testing at the Guided Weapons Evaluation Facility (GWEF) for an improved autopilot repackaged electronics, extended rocket motor, shortened control actuator, and improved electronic counter-counter measures (ECCM).

Hellfire - Production lot and pre-planned product improvement (P3I) testing of Hellfire and Longbow Apache Hellfire Modular Missile Systems.

CHICKEN LITTLE** - A joint Army-Air Force smart weapons test and evaluation organization hosted at Eglin. This organization conducts seeker/sensor, lethal mechanism, and system effectiveness evaluations.

Joint Stars - Tests are conducted on Eglin ranges to evaluate Joint Stars capability to detect and track multiple targets in various environments.

SEEK EAGLE - Air Force stores compatibility program hosted at Eglin AFB. Flight tests to verify weapon separation simulations are conducted on Eglin ranges.

F-15E Tactical Electronic Warfare Systems (TEWS) - Electronic counter measures performance testing.

Sensor Fuse Weapons - Production lot testing and P3I testing.

Joint Tactical Information Distribution System - Testing of information transfer among various types of JTIDS terminals is conducted on Eglin ranges.

Joint Direct Attack Munition* - JDAM is a joint Air Force-Navy program. Development, Test and Evaluation test planning and flight testing are conducted.

Joint Stand Off Weapon* - JDAM is a joint Air Force-Navy program. Development, Test and Evaluation test planning and flight testing are conducted.

AIM-9X (Air launch, Intercept Mission) - This program is a joint Air Force-Navy program led by the Navy. The 46th Test Wing is principal Air Force test office. Captive flight testing, separation testing, and live launches will be conducted during the next three years.

CURRENT IMPORTANT PROGRAMS (continued)

Advanced Short Range Air-to-Air Missile (British) and Various Allied Weapons - A component of allied munitions testing. The ASRAAM TRIALS (essentially Development, Test and Evaluation) are being conducted by a British Aerospace establishment team at Eglin.

Wind Corrected Munition Dispenser - WCMD allows standard cluster bombs to become smart weapons. Development, Test and Evaluation test planning and flight testing are being conducted.

Joint Air-to-Surface Standoff Missile* - JASSM is a joint Navy and Air Force program to acquire a next generation air launch, long range, precision guided standoff missile weapon system. Planning and Testing for the Program Definition and Risk Reduction Phase are ongoing for both contractors.

US Navy Aerial Targets - The F-16 has been selected as a launch platform for the AQM-37 and BQM-74 aerial targets. Flight testing planning and execution are being conducted to provide a limited flight clearance for the F-16 to launch the drones during US Navy operations.

A-10 Testing - Three major programs have been conducted to enhance the capability of the aircraft. The Low Altitude, Safety, and Targeting Enhancement (LASTE) program introduced new software capabilities. The Embedded Global Positioning System and Inertial Navigation System (EGI) Program increased the navigation accuracy of the aircraft. The 600-Gallon Tank program resolved stability and control questions needed to increase loiter time.

Low Cost autonomous Attack System - Testing of the unpowered LOCAAS is being conducted over Eglin land ranges to evaluate the systems ability to acquire, classify, and attack ground targets.

Anti-Jam GPS Technology Flight Test - The AGTFT, which is similar to a JDAM, is designed to resist GPS jamming and is currently being evaluated by the 46th Test Wing.

Air Force Mission Support System (AFMSS) - Testing of the core software and many of the 50 plus aircraft/weapon/electronic system software modules for mission planning.

The following are Technology Transfer Programs providing unique T&E facilities/capabilities for commercial use. Capabilities are followed by actual commercial test efforts (if applicable).

Advanced Transportation and Automotive - Accomplish vehicle and automated highway systems tests in varying climatic conditions; test sensors under controlled electromagnetic environment; collision avoidance sensor tests.

Law Enforcement and Security - Intrusion, surveillance, access control, and weapons and ammunition testing.

Medical Equipment - Characterize electromagnetic emissions of equipment; test compatibility with helicopters, aircraft, or ambulances; test systems under controlled climatic conditions.

CURRENT IMPORTANT PROGRAMS (continued)

Communications Aviation - Test aircraft in climatic chamber; evaluate electromagnetic compatibility in large anechoic chamber; test on open air ranges. Interstate Electronics - advanced GPS navigation equipment.

Environmental - Use infrared and other technologies to test forest fire detection, and pollution detection. Apply expertise in environmental monitoring, restoration and field data collection. Accu-Weather - software evaluation for weather assessment.

Software/Modeling and Simulation - Access CRAY Supercomputer; use AFDTC developed software products.

At Holloman AFB, Hypersonic lethality testing for Threat Missile Defense (TMD), Crew Escape System Technology (CREST) tests, Global Positioning System (GPS) integration, field tests of the Federal Aviation Administration's (FAA) GPS navigational and landing aids, and electromagnetic testing including radar cross section and antenna pattern measurements of such advanced systems as the F-117, B-2, and other advanced technology.

***Navy and Air Force Joint Programs**

****Army and Air Force Joint Programs**

EQUIPMENT/FACILITIES

Capabilities and facilities include those for armament and C4I (Command, Control, Communication, Computer System) testing. The only DOD location with contiguous major land (724 sq. mi.) and water test ranges (125,000 sq. mi.), and the largest climatic test facility in the free world. Equipment and facilities include: a DoD High Performance Computing Center (real time and post mission support); airborne and ground based multispectral signature measurement; kinetic energy test facility (sled track); static warhead arenas; gun test facility; combined hardware and simulations testing (Guided Weapons Evaluation Facility - GWEF) and Preflight Integration of Munitions and Electronic Systems (PRIMES) facility; time-space-position information; telemetry systems facilities including airborne relay; airborne and surface targets; ground threat systems; base installation and security systems (BISS) test facility; photographic laboratory; marine operations (over water test support); and aircraft maintenance (test associated) facilities.

Also, at Holloman AFB, High Speed Test Track (HSTT): The world's longest sled track (50,788 ft), the Project Reliance lead for all DoD test tracks, and the Center of Excellence for ejection seat testing. The HSTT supports sled speeds exceeding Mach 8 and accelerations up to 200G for aerodynamic tests, impact tests, and missile simulations in various controlled environments of rain, particle, and blast/shock wave; (b) Central Inertial Guidance Test Facility (CIGTF): America's most seismically stable (0.01 micro G isolated background level) test bed for truth reference validation of navigation systems. CIGTF has the largest collection of precision rate tables (10), multi-axis tables (12), and precision centrifuges (3) in DoD; (c) Radar Target Scatter (RATSCAT) Mainsite and RATSCAT advanced measurement for full-scale and sub-scale systems--up to 100,000 lbs at Mainsite and 30,000 lbs at RATSCAT Advanced Measurement Site (RAMS). Both facilities have computer resources to support Radar Cross Section (RCS) target predictions, detection profiles, model validation, and real-time diagnostic imaging; and (d) 586th Flight Test Squadron: Aircraft support for testing of air-to-air missiles, air-to-ground ordnance, photo/safety chase, inertial navigational systems, and Global Positioning Systems. The squadron owns two T-38's, rents an F-15 and F-16 from Eglin AFB, and rents a C-12 from the Army when needed.

Development Test Center
Eglin AFB, FL 32542-5498
(850) 882-3931

Commander: MG Stewart E. Cranston
Exec. Director: Dr. J. Daniel Stewart

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	249.870	1.100	246.160	497.130
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	249.870	1.100	246.160	497.130
Procurement	0.000	NA	0.060	0.060
Operations & Maintenance	11.430	NA	15.540	26.970
Other	27.360	NA	21.380	48.740
TOTAL FUNDING	288.660	1.100	283.140	572.900

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	5.780

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	0	419	3,783	4,202
CIVILIAN	7	584	2,013	2,604
TOTAL	7	1,003	5,796	6,806¹

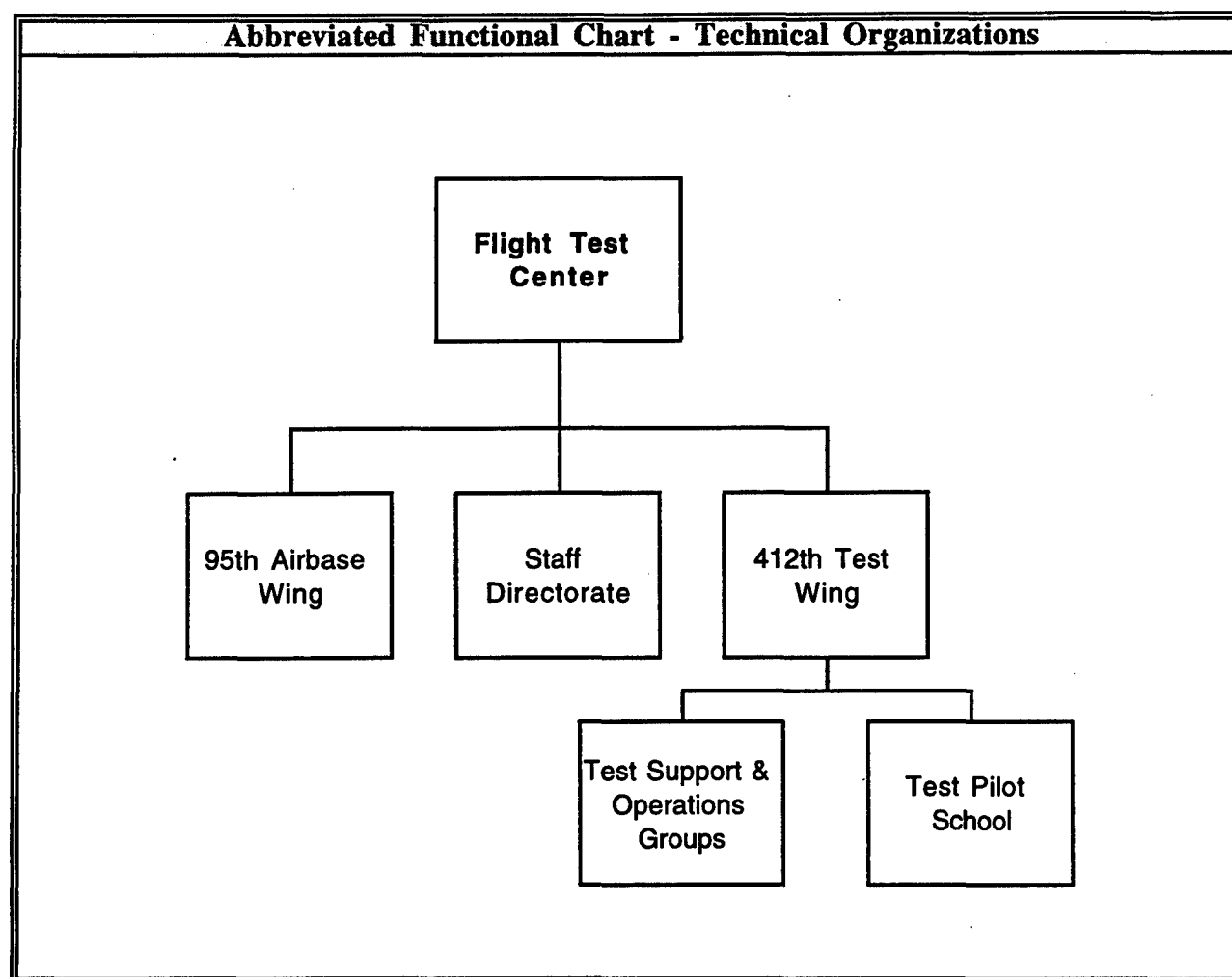
SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	2,321.171	REAL PROPERTY	933.398
ADMIN	897.209	* NEW CAPITAL EQUIPMENT	0.000
OTHER	9,428.241	EQUIPMENT	714.549
TOTAL	12,646.621	* NEW SCIENTIFIC & ENG. EQUIP.	0.300
ACRES	463,533	* Subset of previous category.	

NA = Not Applicable

¹ 63 personnel included here are summer hires.

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Flight Test Center



Flight Test Center

Edwards AFB, CA 93524-1000
(805) 277-2704

Commander: MG Richard L. Engel
Exec. Director: James A. Papa

MISSION

The Air Force Flight Test Center (AFFTC) is charged with supporting the Air Force Material Command (AFMC) mission by conducting and supporting research, development, test and evaluation of manned and unmanned aerospace systems. This mission involves not only all aspects of testing of aerospace systems and subsystems, but also includes development testing of aerodynamic decelerators and the operation of the Air Force Test Pilot School. To support this testing the AFFTC operates and manages the Edwards Flight Test Range. The Center operates a fleet of test bed aircraft for early development and check out of new avionics. The Center also operates a fleet of Advanced Range Instrumentation Aircraft (ARIA) for worldwide support to a variety of space and missile tests. The Center supports and participates in research, development, test and evaluation programs for other Air Force Commands, other Departments of Defense and government agencies, as well as for contractors and foreign governments.

CURRENT IMPORTANT PROGRAMS**B-1 BOMBER AVIONICS AND CONVENTIONAL WEAPONS UPGRADES**

The B-1B is a flexible bomber with a large payload capability and long range that makes it an ideal aircraft to support our deterrent posture across the full spectrum of conflict. The B-1B has been designated to form the core of future conventional bomber capability. The challenge of a conventional role requires the development of an extensive offensive and defensive capability without compromising current capability. The conventional mission upgrade program is planned to accomplish the changes required for the B-1B aircraft to become an effective conventional bomber.

B-2 BOMBER FOLLOW-ON PROGRAM

The B-2 Follow-on Flight Test Program is a Development Test and Evaluation program. The program is a continuance of the test critical technical characteristics. The evaluation includes signature, composite structure, flight control system, air data system, and software integration. Testing will support activity in the following priority: safety of flight, initial system capability, and full capability. Must verify specification compliance for operational assessment.

B-52 BOMBER UPGRADES.

The advanced weapons integration program will span all smart weapon development/integration on the B-52 to include Joint Direct Attack Munitions (JDAM), Joint Stand-Off Weapons (JSOW), Joint Air-to-Surface Stand-Off Missile (JASSM) etc.

CURRENT IMPORTANT PROGRAMS (continued)**C-17 TRANSPORT FOLLOW-ON PROGRAM**

The C-17 Follow-On Flight Test Program is a Development Test and Evaluation program. This program will support the fielded system which results from the C-17 Weapon System Production, Field Support or Flexible Sustainment contract and support enhancements to C-17 capabilities by supporting the authorized Producibility Enhancement/Performance Improvement Program. The program will encompass, but is not limited to, testing needed for engineering studies, preplanned product improvements, performance improvements, system upgrades, modifications of production equipment, field problem evaluations, production cut ins, and mission changes. The program will provide data for use in design studies, system development, field problem resolution specification compliance and performance characteristic evaluations.

C-130J TRANSPORT

The C-130J Test and Evaluation program is scheduled to be flight tested at Edwards AFB. The tests support the development and demonstration of the basic Lockheed C-130J aircraft and unique USAF C-130J systems. Other activities included takeoff and landing performance testing, enhanced cargo handling system development and demonstration evaluations and auto thrust control testing. Additionally, air drop testing, which required chase/photo compatible aircraft, was accomplished.

F-15 FIGHTER

The F-15 Development Test and Evaluation (DT&E) program provides general avionics laboratory and overhead support for the F-15 System Program Office DT&E program requirements. Specific program objectives, descriptions and requirements are in support of radar, avionics operational flight program updates and the F-15E. The F-15 test aircraft at Edwards support a variety of non F-15 SPO programs such as B-1B Avionics Testing, Engine Testing, and F-15E/LANTIRN Integration DT&E.

F-16 FIGHTER

The F-16 Follow-on DT&E program is a continuing effort to add enhanced tactical capabilities and correct previously identified deficiencies. Testing centers around the development and integration of major production blocks 30B, 40, 50. A/B model testing will center on planned retrofit of selected capabilities. Testing will be conducted by a large test force and will involve virtually every technical discipline within the AFFTC mission. Additional test efforts will involve evaluations of the improved performance version of the Pratt and Whitney F100 and General Electric F110 engines.

F-117 FIGHTER

The F-117 test program provides for the continuous test of all systems as they are made available to the test team. As the aircraft systems mature, testing to include maintainability, reliability, survivability and effectiveness are evaluated. The goals of the test program are to ensure the F-117A stealth fighter can be deployed anywhere in the world at a moments notice and carry out it's intended mission—to employ stealth technology and precision weapon delivery on time and on target.

CURRENT IMPORTANT PROGRAMS (continued)**F-22 ADVANCED TACTICAL FIGHTER**

The F-22 is being developed to meet air superiority requirements for the 1990's and beyond. This aircraft will incorporate state of the art materials, avionics, weapons and control systems. Testing facilities will be required on a very large scale. Some new facilities may be required. It is anticipated that the program will make extensive use of avionics ground test facilities and Edwards and several off-site locations. Provisions will be made for adequate IOT&E testing, climatic tests and technical order validation and verification. Testing is planned for airframe, engine, and envelope expansion test. Avionics will be installed and integrated incrementally.

JOINT STRIKE FIGHTER

The Joint Strike Fighter (JSF) Test and Evaluation (T&E) Support Office is responsible for all AFMC T&E support conducted in executing the JSF Concept Demonstration Phase (CDP) and planning for the E&MD Phase. The JSF T&E Support Office provides a single point of contact for the member services, Office of the Secretary of Defense, AFMC and the Weapon Systems Contractors for AF T&E related matters. Specifically, the JSF T&E Support Office: coordinates AFMC test facilities and T&E resources; provides input to the Test and Evaluation Master Plan and the Flight Certification Plan; helps coordinate the combined DT and OT activities; serves as liaison between the Weapon Systems Contractors and government ground and flight test teams; helps coordinate the systems' safety requirements and helps develop and execute the Concept of Operations for the Concept Demonstration Aircraft. Personnel spread across the 412th Test Wing are currently accomplishing these actions. This proposed change would bring these people together and provide a single AFMC T&E team to support the customer needs.

LANTIRN

The test effort supports the continued development and refinement of the LANTIRN navigation and targeting pod. Efforts include continuing software development and area tracker testing.

BIG CROW

The Big Crow Electronic Warfare Vulnerability Assessment Program. The overall mission of Big Crow is to project an electronic warfare environment for electronic warfare vulnerability assessments. The system contains the capability to capture data required to accomplish vulnerability assessments for the Department of Defense C2I weapon systems. Follow-on modification assistance includes support of engineering design, engineering drawing and quality reviews.

EQUIPMENT/FACILITIES

Major unique facilities and equipment include: Integrated Facility for Avionics System Test (IFAST), Benfield Anechoic Facility (BAF), and Test & Evaluation Mission Simulator (TEMS) as part of the Electronic Combat Integrated Test (ECIT) complex; Edwards Flight Test Range (EFTR) which includes the real time mission control facilities, Precision Impact Range Area (PIRA) used for bombing/gunnery/infrared systems integration, personnel and cargo parachute drop zones, photo resolution range, and instrumented low level terrain following course; hydrant refueling system for heavy aircraft; aircraft weight and balance facility complex; photo/video lab for airborne and ground testing; intermediate aircraft maintenance support capability; Pacer Comet (jet engine test facility); horizontal aircraft thrust stand; and aircraft gun system harmonization range (GUNBUTT).

Flight Test Center
 Edwards AFB, CA 93524-1000
 (805) 277-2704

Commander: MG Richard L. Engel
 Exec. Director: James A. Papa

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	0.000	0.000	0.000	0.000
6.3	0.000	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000	0.000
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	240.443	0.764	334.510	575.717
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	240.443	0.764	334.510	575.717
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	9.604	NA	31.419	41.023
Other	6.237	NA	18.115	24.352
TOTAL FUNDING	256.284	0.764	384.044	641.092

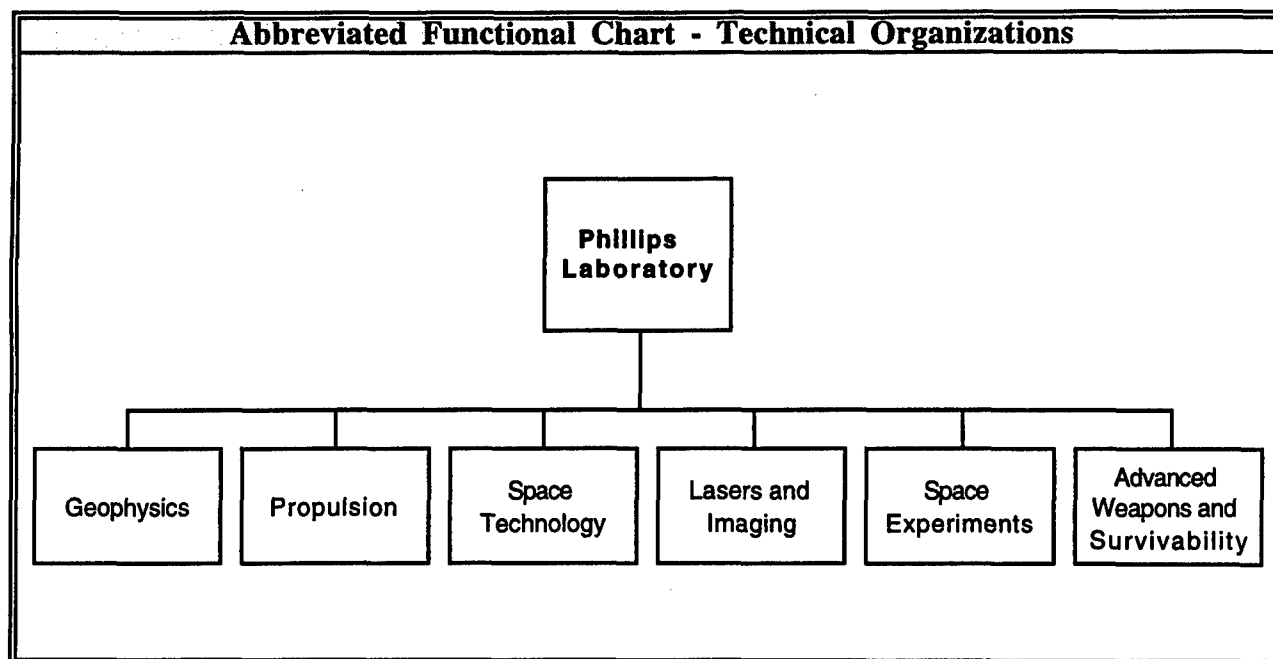
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	21.750

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	5	154	4,047	4,206
CIVILIAN	6	616	2,635	3,257
TOTAL	11	770	6,682	7,463

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	283.000	REAL PROPERTY	807.896
ADMIN	276.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	9,031.000	EQUIPMENT	337.000
TOTAL	9,590.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	297,375	* Subset of previous category.	

NA = Not Applicable

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Phillips Laboratory

Phillips Laboratory
Kirtland AFB, NM 87117-5776
(505) 846-0241

Commander: Colonel Michael L. Heil
Vice Commander: Dr. R. Earl Good (SES-3)

MISSION

I. The mission of Phillips Laboratory (PL) is to advance science and technology to provide the developments and improvements needed to continue the accomplishment of the Air Force mission. PL is primarily charged with planning, organizing, directing, executing, and controlling USAF research and development in the following areas: a) Space and Missiles Technology; b) Space Experiments; c) Directed Energy Weapons, and Weapons Effects; d) Survivability; and e) Geophysics Technical Developments and Effects on Systems.

II. Phillips Laboratory reorganized in October 1997 under the Air Force Research Laboratory. This will be the last Phillips Laboratory survey.

CURRENT IMPORTANT PROGRAMS

The following are some of the current important programs (thrusts) on which the laboratory is working:

(a) **Space and missiles technology** focuses on spacecraft structures, power and thermal management, sensors, and electronics.

(b) **Space experiments** are conducted in a ground, balloon-borne, aircraft or space mode. Also included are related ground acceptance and space/launch environmental testing.

(c) **Propulsion technology** focuses on advanced concepts involving motors, propellants and test techniques. Most of this work is performed by Phillips Laboratory employees at Edwards Air Force Base.

(d) **Airborne laser technology** will be able to acquire, track, and kill theater ballistic missile during their boost phase.

(e) **Lasers and imaging technology** involves demonstrating the technical and engineering feasibility of lasers and imaging systems.

(f) **Advanced weapons and survivability** develops high-energy plasma and microwave technologies, electromagnetic pulse hardening, space systems survivability, and advanced techniques and computer simulations for weapon effects.

(g) **Geophysics** conducts research to further Air Force understanding of the environment between the Earth and Sun and its effects on systems and operations. This work is conducted by Laboratory people at Hanscom Air Force Base.

EQUIPMENT/FACILITIES

Primary operating locations are: Kirtland AFB NM, Edwards AFB CA, and Hanscom AFB MA. Unique facilities include: at Kirtland AFB, the Space Structures/Composites Laboratory, Aerospace Engineering Facility, High Energy Research and Technology Facility, High Energy Microwave Laboratory, High Energy Plasma Laboratory, Starfire optical Range, and underground tunnels in the Manzano Weapons Storage Area; at Edwards AFB, rocket test stands, Hydrodynamic Test laboratory, Chemical Experiments Laboratory, National Hover Test Facility; at Hanscom AFB, Haskell Observatory, Satellite Communications Facility, LIDAR Facility, Ionospheric Modification Laboratory, Air Force Interactive Meteorological System Laboratory, Weather Characterization & Advanced Weather System Laboratory, Cryogenic Simulation Facility, and IR Detection Facility.

Phillips Laboratory
Kirtland AFB, NM 87117-5776
(505) 846-0241

Commander: Colonel Michael L. Heil
Vice Commander: Dr. R. Earl Good (SES-3)

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	9.604	0.557	10.762	20.923
6.2	18.401	38.893	80.623	137.917
6.3	15.514	6.918	187.217	209.649
Subtotal (S&T)	43.519	46.368	278.602	368.489
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.146	44.135	44.281
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	4.171	1.678	45.013	50.862
TOTAL RDT&E	47.690	48.192	367.750	463.632
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	1.681	NA	0.000	1.681
Other	11.916	NA	152.149	164.065
TOTAL FUNDING	61.287	48.192	519.899	629.378

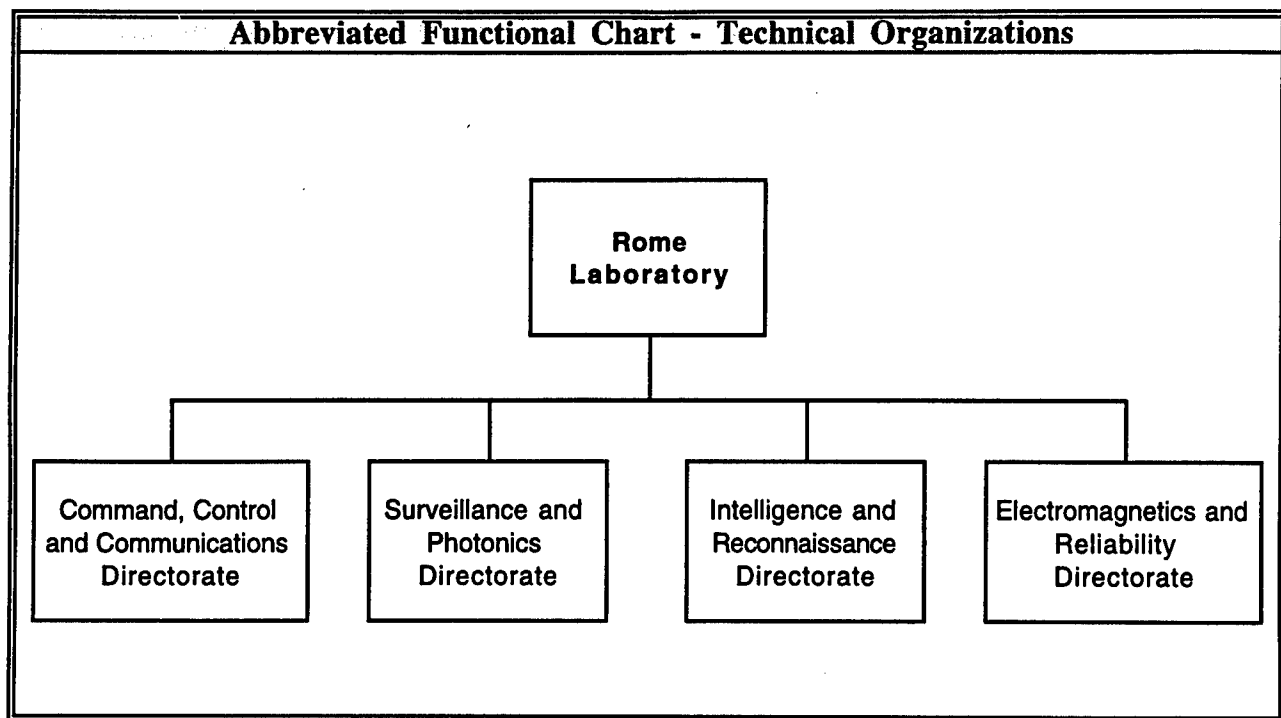
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	47	179	272	498
CIVILIAN	214	331	601	1,146
TOTAL	261	510	873	1,644

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	996.000	REAL PROPERTY	1,051.200
ADMIN	652.000	* NEW CAPITAL EQUIPMENT	8.000
OTHER	846.000	EQUIPMENT	1,109.500
TOTAL	2,494.000	* NEW SCIENTIFIC & ENG. EQUIP.	12.000
ACRES	16,620	* Subset of previous category.	

NA = Not Applicable

Rome Laboratory



Rome Laboratory
Rome, NY 13441-4514
(315) 330-3053

Director: Mr. Raymond P. Urtz
Deputy Director: Vacant

MISSION

Advance the state-of-the-art of science and technology in Command, Control, Communications, Computing and Intelligence (C4I) research and development and transition these technologies to meet customer needs. To achieve this, the laboratory:

- a. Conducts vigorous research, development, and test programs in all applicable technologies.
- b. Transitions technology to current and future systems to improve operational capability, readiness, and supportability.
- c. Provides a full range of technical support to Air Force Materiel Command product centers and other Air Force organizations.
- d. Conducts selected acquisition programs for low-volume, limited quantity intelligence and software systems.
- e. Promotes transfer of technology to the private sector.

Rome Lab supports this mission by developing techniques and equipment for the surveillance of ground and aerospace objects, and for inter-theater and intra-theater survivable communications. Rome Laboratory develops technologies for battle management information systems and the handling of intelligence data. The laboratory is also pursuing the following technologies: artificial intelligence/expert systems, solid state sciences and materials, electromagnetics, photonics, signal processing, computer architectures, and reliability, maintainability and compatibility of electronic systems.

CURRENT IMPORTANT PROGRAMS

The following are some of the important programs on which the laboratory is working: Offboard Augmented Theater Surveillance and High Performance Computing for Joint STARS; Multichannel Airborne Radar Measurements Program; Intelligence data handling; Information For The Warrior; Information Warfare; Secure survivable communication; SPEAKEasy Program; Space Communications Protocol Suite; Low Data Rate Reachback from Airborne Platforms; ARPA/Rome Lab Planning Initiative; Imagery Product Archive; Force Level Execution; Integrated Sensor System; VHDL Design Environment for Legacy Electronics; Signal Exploitation & Hostile Target Identification; Sensor exploitation; Photonics; Optical signal processing, storage and transmission; Timeline Analysis System; Artificial Intelligence; Speech Processing; Storage & Retrieval; Analytical Environments; Concept Based Indexing & Retrieval; Imagery Exploitation; Situation Assessment & Target Analysis; Evolutionary Design of Complex Software; and Real-Time Signal Processor Enhancement.

The Technology Transfer program includes: Utilizing the Education Partnership with Syracuse University to complete market assessments of three Laboratory technologies (Erasable Optical Memory, Two Transistor DRAM Cell, and All Polymer Battery); CRDAs between the Laboratory and New York State Technology Enterprise Corporation (NYSTEC) being executed in the areas of Advanced Communications for the NY State Police and Fraud, Waste and Abuse Tracking for the NY Dept of Social Services; the Laboratory's Partnership Intermediary Agreement with NYSTEC led to the co-development of an In-Vehicle Voice Verification System for the Immigration and Naturalization Service to aid in the traffic flow at US Border Crossings; The Laboratory's Patents data base was increased to include new patents issued that were retrieved from inventors; participated in the joint training exercise Global Apache 97 using advanced communications technology to enhance the capabilities of the warfighter in the field.

EQUIPMENT/FACILITIES

Primary operating locations are: Rome Laboratory, NY and Hanscom AFB, MA. Equipment and facilities include: Reconnaissance Exploitation facility; Photonics facility; Electronic Intelligence (ELINT) Development facility; Electronic Counter-Countermeasures (ECCM) and Signal Processing facility; Solid State Device Failure Analysis facility; Command and Control Technology Center; Communications Experimental facility; Radio Transmission facility; Electro-Magnetic Vulnerability facility; Surveillance facility; Distributed Systems Evaluation Environment facility; Space Time Adaptive Process facility; Airborne Radar Technology Development facility; Audio/Speech Processing facility; SPEAKEASY Test facility; ICARUS Prototype Development & Demonstration facility; Intelligence Support facility; Mass storage facility; Optical Beamforming facility; Integrated Photonics Characterization facility; Materials Synthesis and Development facility; Intelligence facility; Imagery Data Base facility; Network Design facility; Distributed Systems Evaluation Environment Testbed; Software Engineering and Artificial Intelligence facility; and a variety of antenna facilities.

Rome Laboratory
Rome, NY 13441-4514
(315) 330-3053

Director: Mr. Raymond P. Urtz
Deputy Director: Vacant

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	2.583	2.031	12.020	16.634
6.2	48.309	5.033	124.844	178.186
6.3	5.289	4.161	107.428	116.878
Subtotal (S&T)	56.181	11.225	244.292	311.698
6.4	1.794	1.412	19.467	22.673
6.5	0.155	0.122	24.121	24.398
6.6	0.311	0.245	4.019	4.575
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.281	0.220	5.093	5.594
TOTAL RDT&E	58.722	13.224	296.992	368.938
Procurement	1.193	NA	5.693	6.886
Operations & Maintenance	10.084	NA	77.756	87.840
Other	6.473	NA	0.000	6.473
TOTAL FUNDING	76.472	13.224	380.441	470.137

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

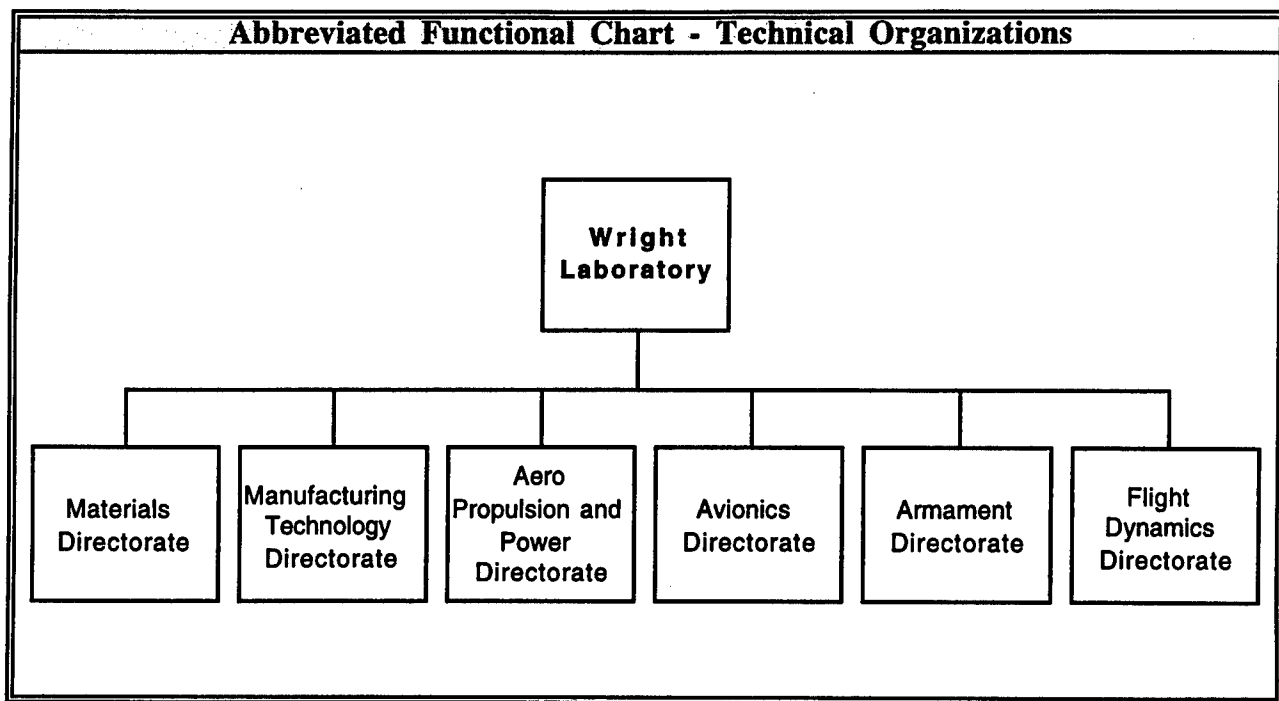
PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	9	54	54	117
CIVILIAN	79	405	422	906
TOTAL	88	459	476	1,023 ²

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	721.000	REAL PROPERTY	52.287
ADMIN	236.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	438.000	EQUIPMENT	113.700
TOTAL	1,395.000	* NEW SCIENTIFIC & ENG. EQUIP.	12.900
ACRES	1,543	* Subset of previous category.	

NA = Not Applicable

² 26 personnel included here are summer hires.

Wright Laboratory



Wright Laboratory
WPAFB, OH 45433-7542
(937) 255-5508

Commander: Colonel Richard W. Davis
Deputy Director: Dr. Vince J. Russo

MISSION

Lead and focus aerospace technology to meet our customer needs.

CURRENT IMPORTANT PROGRAMS

The following are some of the current important programs/thrusts on which the laboratory is working:

Aero Propulsion and Power Technology.

Air Vehicles Technology.

Avionics Technology.

Conventional Armament Technology.

Materials Technology.

Manufacturing Technology.

CRDAs to develop a user friendly program to track hazardous materials; a cost effective rehabilitation of ailing infrastructure (bridges) using composite materials; an understanding of a fire suppression system on high speed vehicles including aircraft; durable coatings on aluminum ice cube trays which has application to aircraft parts; design of a single turbo-fan engine aviation aircraft and fabricate and characterize devices using new organic nonlinear optical materials.

EQUIPMENT/FACILITIES

Primary Operating locations are: Wright-Patterson AFB OH and Eglin AFB FL. Equipment and facilities include:

- (a) **Turbine Research Laboratory** to simulate all relevant engine conditions governing turbine operation.
- (b) **Compressor Research Facility** capable of testing full-scale, multi-stage, and single shaft fans and compressors at speed/powers of 3,000 to 16,000 rpm at 3,000 hp and 16,000 to 30,000 rpm at 15,000 hp.
- (c) **Kinetic Kill Vehicle Digital and Hardware-In-The-Loop Simulation Facility** to realistically simulate launch-to-impact scenario for guided interceptors.
- (d) **Integrated Avionics Lab** for real-time dynamic testing of integrated avionics systems in realistic operational scenarios.
- (e) **In-Flight Simulator** to examine the flight characteristics and properties of different aircraft, different flight control systems and cockpit layouts.
- (f) **Variable Stability In-Flight Simulator Test Aircraft** for flight control, pilot-vehicle interface and avionics/flight control integration research programs.
- (g) **Subsonic Aerodynamic Research Laboratory** with Mach range from 0.2 to 5.0, for high angle of attack testing, very low turbulence, very large force measuring, and testing power-simulated vehicles.
- (h) **DoD Landing Gear Development Facility** for aircraft tire/wheel testing, 350 mph top speed, 150,000 to 1 lb. max load = 20 deg yaw and camber, and aircraft brakes/wheels/tire testing, 200 mph top speed, 350,000 to 1 lb. max load, 220 M ft. lbs. max energy.
- (i) **Laser Hardened Materials Evaluation Lab II** provides well characterized 100+ kw continuous wave, carbon dioxide laser for materials response phenomenology, geometric scaling, and sub-scale component testing.
- (j) **Device Research Laboratory** for extensive experimental growth and characterization of electronic and optical properties of III-V materials and devices.
- (k) **Structures Test Facility** with capability for static and fatigue testing of complete aerospace vehicles.
- (l) **Compact Radar Cross Section Range** with down range imaging capability and capability to measure small targets with accuracy.
- (m) **Optical Research Facility** which can measure far-field patterns of large (up to 2.4 meters in diameter) antenna systems under controlled temperatures and pressure conditions (simulate altitudes up to 270,000 feet).
- (n) **Aeroballistics Research Facility** which is designed to study free-flight characteristics of projectiles and missile configurations under controlled atmospheric conditions (22 +/- deg. centigrade, less than 50% relative humidity). Test range is instrumented for 207 m., 2.66 m. square cross section for first 69 m.

Wright Laboratory
WPAFB, OH 45433-7542
(937) 255-5508

Commander: Colonel Richard W. Davis
Deputy Director: Dr. Vince J. Russo

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.800	NA	NA	0.800
6.1 Other	10.000	1.000	19.900	30.900
6.2	110.200	31.200	212.700	354.100
6.3	3.700	21.100	347.700	372.500
Subtotal (S&T)	124.700	53.300	580.300	758.300
6.4	0.300	2.700	23.300	26.300
6.5	0.000	0.200	92.100	92.300
6.6	0.000	0.000	0.000	0.000
6.7	1.000	6.800	42.200	50.000
Non-DOD	1.000	13.000	91.000	105.000
TOTAL RDT&E	127.000	76.000	828.900	1,031.900
Procurement	0.000	NA	4.200	4.200
Operations & Maintenance	0.200	NA	4.300	4.500
Other	0.000	NA	29.000	29.000
TOTAL FUNDING	127.200	76.000	866.400	1,069.600

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	47	182	87	316
CIVILIAN	201	1,124	729	2,054
TOTAL	248	1,306	816	2,370

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,826.227	REAL PROPERTY	983.500
ADMIN	559.638	* NEW CAPITAL EQUIPMENT	0.500
OTHER	569.220	EQUIPMENT	2,107.190
TOTAL	2,955.085	* NEW SCIENTIFIC & ENG. EQUIP.	12.000
ACRES	1,202	* Subset of previous category.	

NA = Not Applicable

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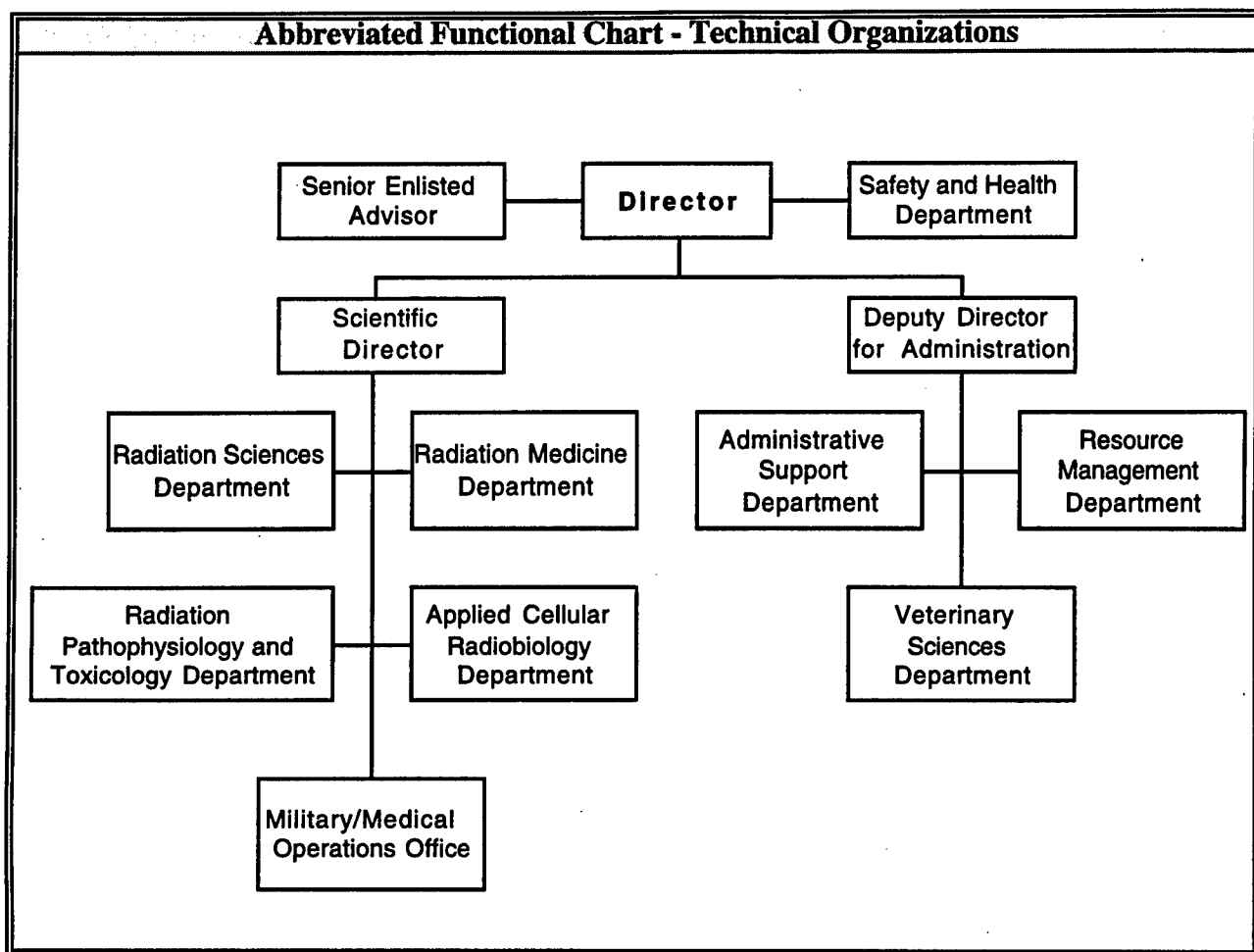
**UNIFORMED SERVICES
UNIVERSITY OF
THE HEALTH SCIENCES**



**UNIFORMED SERVICES UNIVERSITY of the HEALTH SCIENCES
(USUHS)**

The only In-House RDT&E Activity within USUHS is the Armed Forces Radiobiology Research Institute (AFRRI).

Armed Forces Radiobiology Research Institute



Armed Forces Radiobiology Research Institute
Bethesda, MD 20889-5603
(301) 295-1210

Dir.: LTC(P) Robert R. Eng, MS, USA
Scientific Dir.: Dr. E. John Ainsworth

MISSION

The mission of Armed Forces Radiobiology Research Institute shall be to conduct research in the field of radiobiology and related matters essential to the operational and medical support of the Department of Defense and military services.

CURRENT IMPORTANT PROGRAMS

Develop medical countermeasures to treat radiation injuries.

Optimize combinations of protective agents to promote survival and combat effectiveness following irradiation at high or low dose rates.

Development of reliable biodosimetry assays/techniques.

Evaluation of early and late effects of radiation exposures at low dose rates.

Counterproliferation of weapons of mass destruction.

Impact of imbedded depleted uranium shrapnel on biological systems.

Continue to support studies of residents of the former Soviet Union who were exposed to chronic radiation through environmental contamination.

EQUIPMENT/FACILITIES

Functions: operate facilities for conducting radiobiology research and disseminating results, conduct advanced training, provide analysis consultation on bioeffects of radiation, and perform such other research functions as required. Major equipment includes: pulse and steady state nuclear reactor, 100,000-Curie Cobalt-60 irradiator, electron linear accelerator, and steady state X-ray source. Support services include: measurement of radiation fields, provision and care of laboratory animals, equipment design and fabrication assistance, real-time data acquisition system, television and film documentation of experiments, personnel and environmental monitoring, editorial assistance in report preparation, and a large technical library.

Armed Forces Radiobiology Research Institute
Bethesda, MD 20889-5603
(301) 295-1210

Dir.: LTC(P) Robert R. Eng, MS, USA
Scientific Dir.: Dr. E. John Ainsworth

FY97 FUNDING DATA (MILLIONS \$)				
APPROPRIATION	IN-HOUSE	IN-HOUSE MANAGEMENT	OUT-OF-HOUSE	TOTAL
RDT&E:				
6.1 ILIR	0.000	NA	NA	0.000
6.1 Other	0.000	0.000	0.000	0.000
6.2	7.806	0.000	0.175	7.981
6.3	3.187	0.000	0.000	3.187
Subtotal (S&T)	10.993	0.000	0.175	11.168
6.4	0.000	0.000	0.000	0.000
6.5	0.000	0.000	0.000	0.000
6.6	0.000	0.000	0.000	0.000
6.7	0.000	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000	0.000
TOTAL RDT&E	10.993	0.000	0.175	11.168
Procurement	0.000	NA	0.000	0.000
Operations & Maintenance	0.000	NA	0.000	0.000
Other	1.463	NA	0.000	1.463
TOTAL FUNDING	12.456	0.000	0.175	12.631

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1997)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	DOCTORATES	OTHER		
MILITARY	10	22	30	62
CIVILIAN	41	26	33	100
TOTAL	51	48	63	162

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	61.750	REAL PROPERTY	15.000
ADMIN	34.257	* NEW CAPITAL EQUIPMENT	0.274
OTHER	23.908	EQUIPMENT	12.400
TOTAL	119.915	* NEW SCIENTIFIC & ENG. EQUIP.	0.438
ACRES	10	* Subset of previous category.	

NA = Not Applicable

APPENDICES

APPENDIX A
DISESTABLISHMENT, ESTABLISHMENT,
OR CHANGE IN ORGANIZATION NAME

APPENDIX A

**DISESTABLISHMENT, ESTABLISHMENT,
OR CHANGES IN ORGANIZATION NAME
BETWEEN FY96 AND FY97**

DEPARTMENT OF THE ARMY

The Research Institute for Behavioral and Social Sciences is now referred to as the **Army Research Institute**.

DEPARTMENT OF THE NAVY

The Naval Biodynamics Laboratory closed on 30 September 1996.

DEPARTMENT OF THE AIR FORCE

No changes.

DEPARTMENT OF DEFENSE AGENCIES

No changes.

Note: Activities in **bold typeface** were reported in the FY 96 edition of this report as separate Activities.

APPENDIX A

**DISESTABLISHMENT, ESTABLISHMENT,
OR CHANGES IN ORGANIZATION NAME
BETWEEN FY96 AND FY97**

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APPENDIX B
DEFINITIONS OF REPORT ELEMENTS

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

INTRODUCTORY PRECAUTIONARY NOTE

Data in this report should not be summarized or used for comparative analyses between Activities and/or across Services because labs/centers use different business systems to satisfy their special needs. Some organizations (e.g., Navy) operate on an industrial funding basis; that is, they charge their customers for all operating costs, including maintaining their physical plants and providing other necessary support services (e.g., human resources office, finance and accounting support). Other labs/centers (e.g., Air Force) are institutionally funded; that is, they receive most of their funding as direct appropriations from Congress and use these funds for operating support costs as well as for research. In addition, most institutionally funded labs/centers are tenants on larger military bases and receive their support services at reduced or no charge from their host. Even those that own their own facilities receive separate funding support services and do not charge their customers for these overhead costs. Efforts are underway to institute common business practices across the DOD RDT&E labs, but until that occurs comparisons may be misleading.

Organization Chart	B-2
Narratives	B-2
Funding	B-3
Personnel	B-7
Space and Property	B-9

Definitional changes for FY97 are italicized.

APPENDIX B**DEFINITIONS OF REPORT ELEMENTS****ABBREVIATED FUNCTIONAL CHART - TECHNICAL ORGANIZATIONS**

This is a partial organization chart, provided by each Activity, to provide an overview of its technical operations. It does not depict the entire organizational structure and is abbreviated for purposes of this report.

NARRATIVES**Mission Statement**

Stated is the mission of the laboratory or Activity.

Current Important Programs Narrative

Summarized are current important programs on which the laboratory or Activity is working. Any Technology Transition efforts like Cooperative Research and Development Agreements (CRADAs) are identified.

- **Technology Transfer**

Data supplied are any major Technology Transfer efforts underway, including the number of scientists and engineers exchanged with industry or academia.

Equipment/Facilities Narrative

Summarized are the major equipment and facility capabilities of the laboratory or Activity including any unique equipment and facilities not available to the commercial or academic R&D community anywhere else.

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

FUNDING

RDT&E Budget Activities (BAs)

BA	BA Title	Applicable Research Categories
1	Basic Research	6.1
2	Applied Research	6.2
3	Advanced Technology Development	6.3
4	Demonstration and Validation (Dem/Val)	6.4
5	Engineering & Manufacturing Development (EMD)	6.5
6	RDT&E Management Support	6.6
7	Operational Systems Development (OSD)	6.7

In-House RDT&E Activities

These Activities are organizational entities which perform at least 25% of their work in any or all of the categories of research, development, test and evaluation (RDT&E). In addition, at least 25% of an Activity's In-House manpower and/or 25% of the obligation authority used In-House is devoted to one or more of the categories of RDT&E.

Current Year Obligation Authority

Authority for the financial resources available for obligation in the specific year being reported. This excludes unobligated authority carried forward from the prior year. The appropriation category refers to the original funding source, even if it may reimburse a different funding category.

In-House

The total amount for the fiscal year reporting period for mission-oriented work directly performed, or to be performed, by government personnel of the reporting organization.

- **Included:** funding regardless of source (i.e., own Service, sister Service, ARPA, OSD, etc.); costs of supplies and equipment essentially of an off-the-shelf nature, which are procured for use in-house; direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support; *and all overhead costs.*
- **Excluded:** expenses for planning and administering contracts and grants for out-of-house work and expenses for activities performed by contractors of the reporting organization.

In-House Managing Out-of-House

The total amount of funds incurred in planning and administering out-of-house programs by personnel of the reporting organization. **(This data element is not applicable for the Navy. The Navy includes these funds in the In-House category).**

- **Included:** travel and other supporting services.

Out-of-House

The total amount for the fiscal year reporting period for direct mission-oriented work performed, or to be performed, by other than *the government personnel* at the reporting organization.

- **Included:** RDT&E work by other departmental or DoD organizations, industrial firms, educational institutions, not-for-profit institutions, and private individuals.
- **Excluded:** all overhead costs.

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

FUNDING (continued)

6.1 Basic Research

6.1 In Laboratory Independent Research (ILIR)

The total amount for research 6.1 (Navy PE=0601152N) In-Laboratory Independent Research program elements.

6.1 Other In-House/Out-of-House

The total amount for Basic Research 6.1 program elements which are not ILIR but are conducted in-house/out-of-house.

6.1 In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering Basic Research 6.1 programs, by personnel of the organizational entity, which are conducted out-of-house.

6.2 Applied Research

6.2 In-House/Out-of-House

The total amount for Applied Research 6.2 program elements conducted in-house/out-of-house.

6.2 In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering Applied Research 6.2 programs, by personnel of the organizational entity, which are conducted out-of-house.

6.3 Advanced Technology Development

6.3 In-House/Out-of-House

The total amount for Advanced Technology Development 6.3 program elements conducted in-house/out-of-house.

6.3 In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering Advanced Development 6.3 programs, by personnel of the organizational entity, which are conducted out-of-house.

6.4 Demonstration and Validation (Dem/Val)

6.4 In-House/Out-of-House

The total amount for Dem/Val 6.4 program elements conducted in-house/out-of-house.

6.4 In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering Dem/Val 6.4 programs, by personnel of the organizational entity, which are conducted out-of-house.

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

FUNDING (continued)

6.5 Engineering and Manufacturing Development (EMD)

6.5 In-House/Out-of-House

The total amount for EMD 6.5 program elements conducted in-house/out-of-house.

6.5 In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering Engineering and Manufacturing Development 6.5 programs, by personnel of the organizational entity, which are conducted out-of-house.

6.6 RDT&E Management Support

6.6 In-House/Out-of-House

The total amount for RDT&E Management Support 6.6 program elements conducted in-house/out-of-house.

6.6 In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering Management Support 6.6 programs, by personnel of the organizational entity, which are conducted out-of-house.

6.7 Operational Systems Development (OSD)

6.7 In-House/Out-of-House

The total amount for all OSD 6.7 with RDT&E funds conducted in-house/out-of-house. This item is interpreted in its broadest sense to include operational developments outside the systems areas, and not included in any of the above categories.

6.7 In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering Operational Systems Development (OSD) 6.7 programs, by personnel of the organizational entity, which are conducted out-of-house.

Non-DoD

Non-DoD In-House/Out-of-House

The total amount for all In-House/Out-of-House RDT&E not included in 6.1-6.7 as defined above.

Non-DoD In-House Effort Managing Out-of-House Contracts (In-House-Management)

The total amount for expenses incurred in planning and administering RDT&E not included in 6.1-6.7 programs, by personnel of the organizational entity, which are conducted out-of-house

Procurement

Procurement In-House/Out-of-House

The total amount for procurement appropriations in-house/out-of-house regardless of source.

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

FUNDING (continued)

Operation and Maintenance (O&M)

O&M In-House/Out-of-House

The total amount for O&M appropriations in-house/out-of-house regardless of source.

Other

Other In-House/Out-of-House

The total amount for all other appropriations in-house/out-of-house regardless of source. Included are Military Pay and Allowances (MPA) if applicable.

Military Construction (MILCON)

MILCON

This is the total amount for Military Construction appropriations.

Totals

Total RDT&E

The sum of the total amount, regardless of source, for both In-House, In-House Managing Out-of-House, and Out-of-House funding for the following categories:

- ILIR 6.1
- Basic Research 6.1
- Applied Research 6.2
- Advanced Technology Development 6.3
- Demonstration and Validation (Dem/Val) 6.4
- Engineering and Manufacturing Development (EMD) 6.5
- RDT&E Management Support 6.6
- Operational Systems Development 6.7
- Non-DOD

Total Funding

The sum of Total RDT&E, Procurement, Operations & Maintenance and Other.

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

PERSONNEL

Military

Military End Strength

Military end strength is the September 30 strength of Active duty military

- ***Included:*** Transients, trainees, holdees and students.
- ***Excluded:*** Cadets.

Military Scientist and Engineering Doctorates

The total number of military scientists and engineers (officer and enlisted) whose most advanced degree is a doctorate. Degrees must be earned from an accredited college or university. Honorary degrees are excluded. Included are full-time military scientific, engineering, *mathematical, and medical* personnel actively engaged in RDT&E activities. Lawyers, accountants, chaplains, social workers and educators are excluded.

Other Military Scientists and Engineers

The total number of military scientists and engineers (officer and enlisted) who do not hold a doctor's degree, but who are considered professionals. Included are full-time military scientific and engineering personnel actively engaged in RDT&E activities. Lawyers, accountants, chaplains, social workers and educators are excluded.

Military Technical Support and Other Personnel

The total number of Military Technical Support and Other Personnel. This includes all military personnel not listed in the above two categories.

Civilian

Civilian End Strength

Civilian end strength is the September 30 strength of DoD civilian direct hires in a paid, active duty status who are paid from appropriated funds (RDT&E and other appropriations).

- ***Included:*** Part time and temporary personnel.
- ***Excluded:*** Defense Intelligence Agency and National Security Agency personnel.

Civilian Scientist and Engineering Doctorates

The total number of civilian scientists and engineers whose most advanced degree is a doctorate. Degrees must be earned from an accredited college or university. Honorary degrees are excluded. Included are full-time Government scientific, engineering, *mathematical, and medical* personnel actively engaged in RDT&E activities. Lawyers, accountants, chaplains, social workers and educators are excluded.

Other Civilian Scientists and Engineers

The total number of civilian scientists and engineers who do not hold a doctor's degree, but who are rated as professionals. Included are full-time Government scientific and engineering personnel actively engaged in RDT&E activities. Lawyers, accountants, chaplains, social workers and educators are excluded.

APPENDIX B
DEFINITIONS OF REPORT ELEMENTS

PERSONNEL (continued)

Civilian Technical Support and Other Personnel

The total number of Civilian Technical Support and Other Personnel. This includes all civilian personnel not listed in the above two categories.

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

SPACE AND PROPERTY

Acreage

The total number of acres owned, combined with the total number of acres occupied, rounded to the nearest acre. In cases involving tenants who are also RDT&E Activities, the tenants report only the acreage occupied solely by them. The owning Activity reports the remainder including any acreage occupied by non-R&D tenants.

- **Included:** land which is public domain.
- **Excluded:** all easements and permits.

Laboratory Space

The total number of square feet (in thousands)* of permanent and semi-permanent (e.g., fixed-site trailers) building space that is laboratory space.

- **Included:** only walled and roofed building space; facilities assigned to, leased by, or occupied by the reporting organization.
- **Excluded:** parking lots; open storage areas; lean-tos.

Administrative Space

The total number of square feet (in thousands)* of building space that is administrative space (usually that portion occupied by the headquarters and support services staff, and excluding scientists' or engineers' offices in a laboratory which is reported as Laboratory space).

- **Included:** facilities assigned to, leased by, or occupied by the reporting organization.

Other Space

The total number of square feet (in thousands)* of all remaining building space (e.g., hangars, warehouses, garages, etc.).

- **Included:** facilities assigned to, leased by, or occupied by the reporting organization.

*Square feet is expressed in thousands. For example 15,200 square feet is entered as 15.2.

Acquisition Cost of Real Property

The total acquisition cost (in millions \$)** of all land, buildings, and capital equipment and their improvements. An RDT&E owner does not report this information for the facilities assigned to, or occupied by its RDT&E tenants, as they report this information separately.

- **Included:** the cost of installed physical plant equipment, such as HVAC; facilities assigned to, leased by, or occupied by the reporting organization.
- **Excluded:** The cost of acreage or buildings rented from private owners.

Each reporting activity is responsible for determining and reporting the cost of real property. This includes the cost of installed equipment.. This figure represents the true total investment over the life of the activity for real property on hand as of the reporting date.

New Capital Equipment

The total acquisition cost (in millions \$)** for new capital equipment (i.e., installed physical plant equipment such as HVAC) acquired during the fiscal year reporting period. This amount is also included in the entry for Acquisition Cost of Real Property.

APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

SPACE AND PROPERTY (continued)

Acquisition Cost of Equipment

The total acquisition cost (in millions \$)** of all "personal property" equipment. An RDT&E owner does not report this information for the facilities assigned to, or occupied by its RDT&E tenants, as they report this information separately.

- **Included:** The cost of installed equipment directly related to mission execution, such as lab test equipment; the cost of equipment in facilities assigned to, leased by, or occupied by the reporting organization.
- **Excluded:** The cost of physical plant equipment reported under Acquisition Cost of Real Property (explained previously).

Each reporting activity is responsible for determining and reporting the cost of personal property. This cost includes those costs incurred by the acquisition (including installation when applicable) of all property other than real property. It includes personal property such as machine tools, environmental test equipment, furniture, laboratory equipment, vehicles, etc. Items having a unit cost of less than \$200 are excluded. The figure represents the cost of all personal property acquired throughout the life of the activity, to the reporting date, that is still on hand.

New Scientific & Engineering Equipment

The total acquisition cost (in millions \$)** for new scientific & engineering equipment acquired during the fiscal year reporting period. This amount is also included in the entry for Acquisition Cost of Equipment.

- **Included:** The cost of installed equipment directly related to mission execution, such as lab test equipment.

** Dollars are expressed in millions rounded to the nearest thousand. For example, \$2,517,830 is entered as 2.518.

APPENDIX C
SELECTED STANDARD ABBREVIATIONS
AND ACRONYMS

APPENDIX C

SELECTED STANDARD ABBREVIATIONS AND ACRONYMS

ACTD	-	Advanced Concept and Technology Demonstration
AI	-	Artificial Intelligence
ASW	-	Antisubmarine Warfare
ATC	-	Air Traffic Control
ATCCS	-	Army Tactical Command and Control System
ATD	-	Advanced Technology Demonstration
BRAC	-	Base Realignment and Closure
BW	-	Biological Warfare
C2	-	Command and Control
C4I	-	Command, Control, Communications, Computers, and Intelligence
CAD	-	Computer Aided Design
CAE	-	Computer Aided Engineering
CAM	-	Computer Aided Manufacturing
CB	-	Chemical Biological
CBR	-	Chemical, Biological, Radiological
CG	-	Commanding General
CINC	-	Commander in Chief
CM	-	Countermeasures
CNO	-	Chief of Naval Operations
CONUS	-	Continental United States
COTS	-	Commercial off-the Shelf
CRADA	-	Cooperative Research and Development Agreement
CW	-	Chemical Warfare
DA	-	Department of the Army
DOD	-	Department of Defense
DON	-	Department of the Navy
DREN	-	Defense Research and Engineering Network
DT&E	-	Development, Test, and Evaluation
DTAP	-	Defense Technology Area Plan
ECCM	-	Electronic Counter-Countermeasures
ECM	-	Electronic Countermeasures
ELINT	-	Electronic Intelligence
EMI	-	Electromagnetic Interference
EMP	-	Electromagnetic Propagation
EMV	-	Electromagnetic Vulnerability
EMW	-	Electromagnetic Warfare
EOD	-	Explosive Ordnance Disposal
EPA	-	Environmental Protection Agency
EW	-	Electronic Warfare
FSN	-	Foreign Service National
GPS	-	Global Positioning System
HF	-	High-Frequency
HVAC	-	Heating, Ventilation, and Air Conditioning
IAC	-	Information Analysis Center
IEW	-	Intelligence Electronic Warfare
IFF	-	Identification, Friend or Foe
ILIR	-	In-Lab Independent Research
IR	-	Infrared
IR&D	-	Independent Research and Development
KE	-	Kinetic Energy
LAN	-	Local Area Network

APPENDIX C

SELECTED STANDARD ABBREVIATIONS AND ACRONYMS

M&S	-	Modeling and Simulation
MOA	-	Memorandum of Agreement
MOU	-	Memorandum of Understanding
MRTFB	-	Major Range and Test Facility Base
MSRC	-	Major Shared Resource Center
NBC	-	Nuclear, Biological and Chemical
NVD	-	Night Vision Devices
OCONUS	-	Outside the Continental United States
OSD	-	Office of the Secretary of Defense
PEO	-	Program Executive Officer
PM	-	Program Manager
POL	-	Petroleum, Oil, Lubricants
R&D	-	Research and Development
RDT&E	-	Research, Development, Test and Evaluation
RF	-	Radio Frequency
SOF	-	Special Operations Forces
S&T	-	Science and Technology
SBIR	-	Small Business Innovation Research
STO	-	Science and Technology Objective
T&E	-	Test and Evaluation
TF XXI	-	Task Force XXI
UAV	-	Unmanned Aerial Vehicle
USCG	-	United States Coast Guard
USMC	-	United States Marine Corps
USW	-	Undersea Warfare
UUV	-	Unmanned Undersea Vehicle
UV	-	Ultraviolet
WAN	-	Wide Area Network